

AUGUST • 1954
PRICE 35 CENTS

ELECTRICAL CONSTRUCTION AND MAINTENANCE

WITH ELECTRICAL CONTRACTING

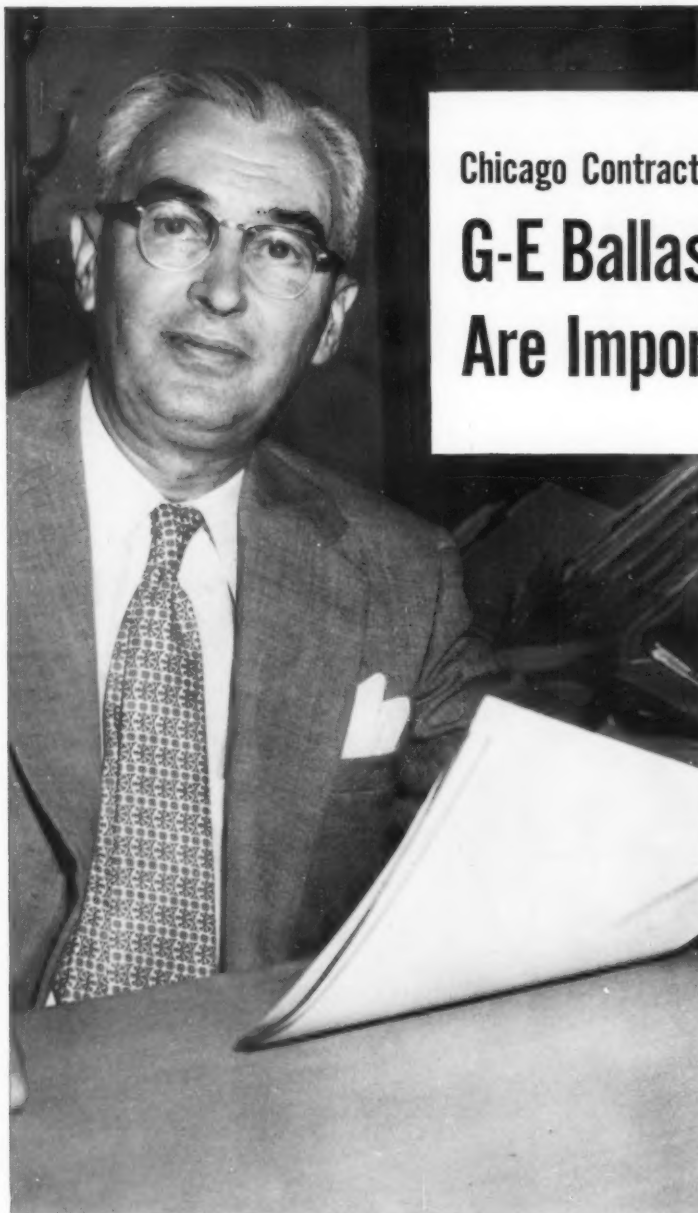


Multipurpose electrical ceiling provides environment control in California aircraft design building. page 63

Mineral insulated cables carry underground municipal fire and police signal circuits at Bayonne, N. J. page 72



Electrical modernization converts old car barns to modern New England supermarket. page 77



Chicago Contractor says... "Sure I use G-E Ballasts—My Customers Are Important to Me!"

Mr. Henry F. Ullrich is purchasing agent of a successful lighting contractor firm in Chicago, Illinois—the Kelso-Burnett Electric Co. When asked about G-E ballasts, he had this to say:

"I use fixtures that are equipped with G-E fluorescent ballasts because I know from experience that they're not going to cause trouble. I'd say that they can be counted on to give extra years of service.

"Lately I've noticed an increase in the number of calls for replacement ballasts. Whenever I get one of these, I make certain I use a G-E ballast. Then I know I'll have a satisfied customer. Sure I use G-E ballasts. Why shouldn't I! My customers are important to me!"

Years of design leadership and expert manufacturing techniques account for the popularity of G-E ballasts with men who know the lighting business—men like Mr. Ullrich.

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Mr. Contractor, we have for you one of the most useful publications ever prepared on ballasts. It's a cross-reference chart which tells you at a glance the catalog numbers of similar ballasts produced by leading manufacturers. It will make it easy for you to use G-E Ballasts for replacement. Get your copy today—free of course! Mail this coupon.

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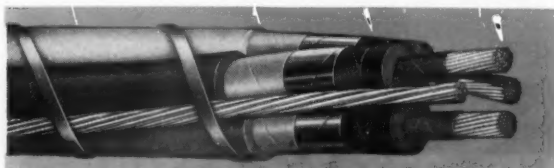
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You need U. S. GRIZZLY Uskorona-insulated Power Cables

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As the only wire manufacturer that grows its own natural

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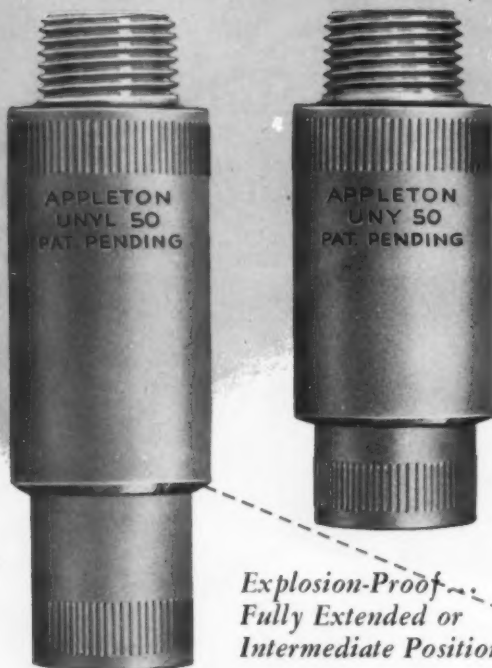


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EXPANSION UNIONS

by

APPLETON



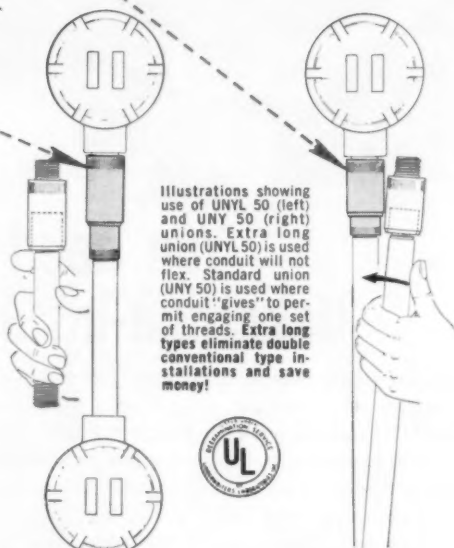
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UNY Union showing up to 21/32" expansion . . . for installation wherever conventional types were previously used!

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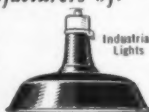
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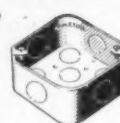
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ELECTRICAL CONSTRUCTION AND MAINTENANCE

with which is consolidated Electrical Contracting, The
Electrifier and Electrical Record ... Established 1901

53rd Year AUGUST • 1954

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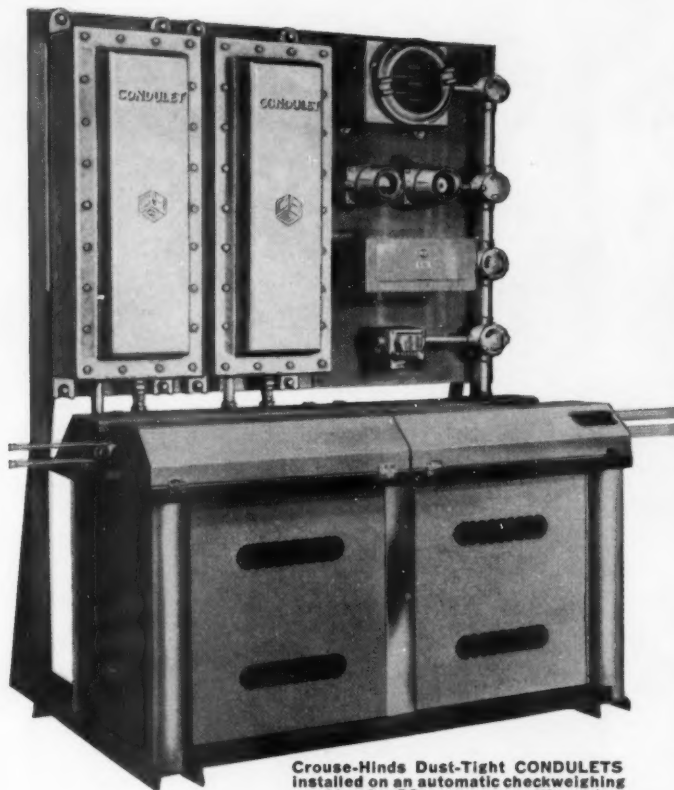
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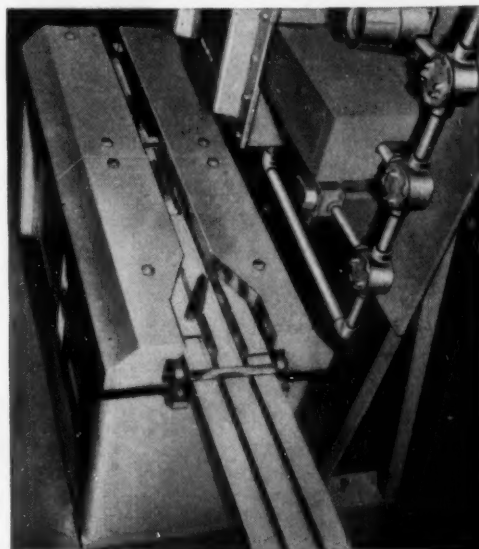
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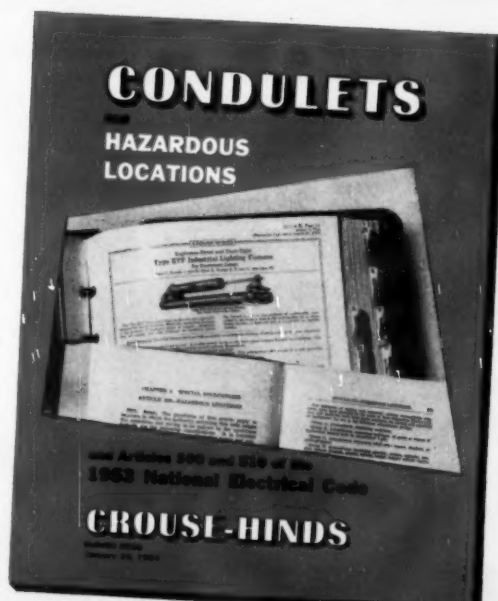
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^{*}CONDULET is a coined word registered in the U.S. Patent Office. It designates a product made only by the Crouse-Hinds Company.



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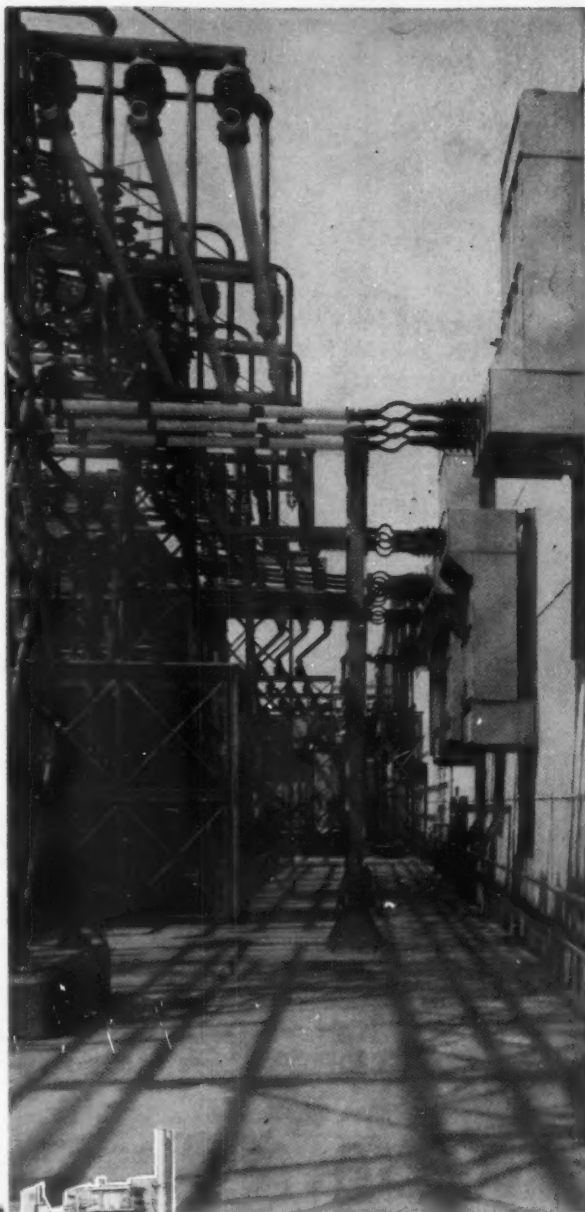
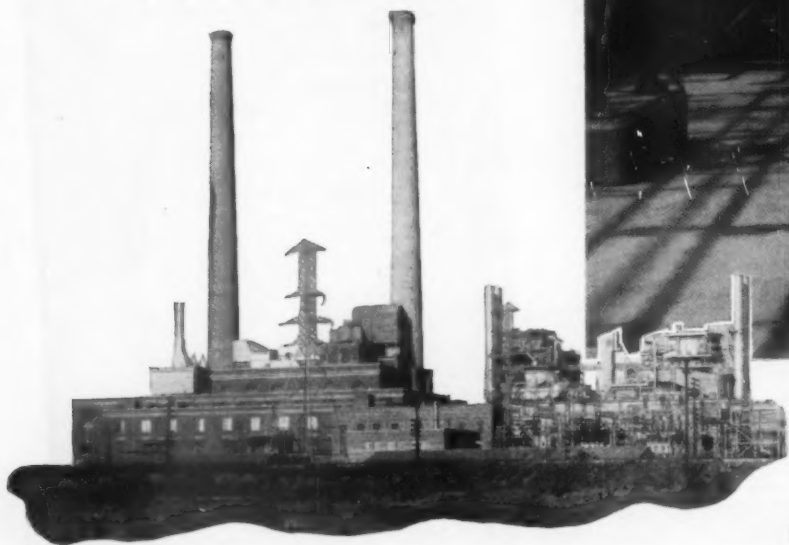
15 KV. HIGH VOLTAGE BUS RUNS

At the Dallas Steam Electric Station of Dallas Power & Light Company, segregated phase bus runs furnished by Roller-Smith deliver 3500 amperes at 13,800 volts from the indoor switchgear to the outdoor transformer station.

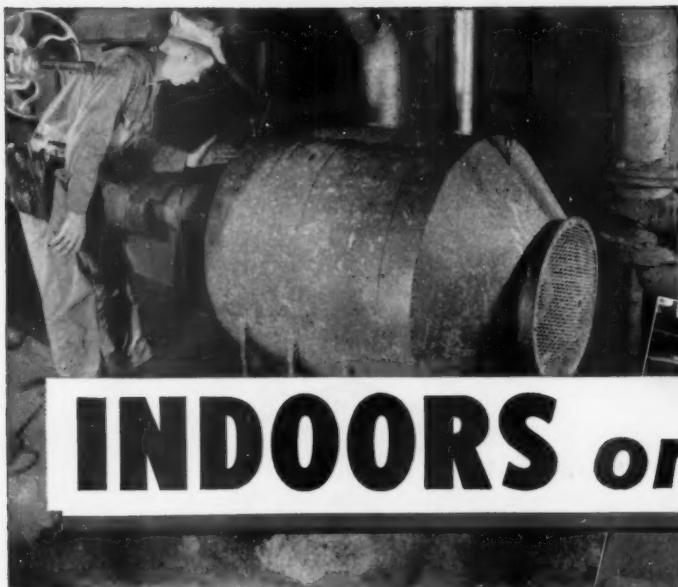
The installation totalled approximately 900 feet of high voltage bus runs . . . segregated and non-segregated phase types . . . both 1200 and 3500 ampere and associated equipment for the interconnection of generators, switchgear and outdoor equipment.

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A-4222

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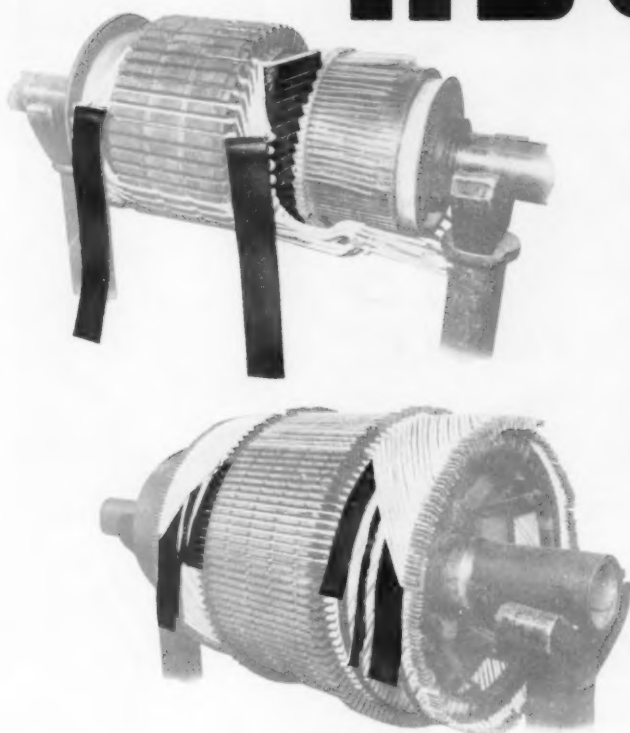


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WAKEFIELD

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BETA-PLEX

For more information and a folder on Beta-Plex, write The F.W. Wakefield Brass Company, Vermilion, Ohio. In Canada, Wakefield Lighting Limited, London, Ontario.

LUMINAIRES

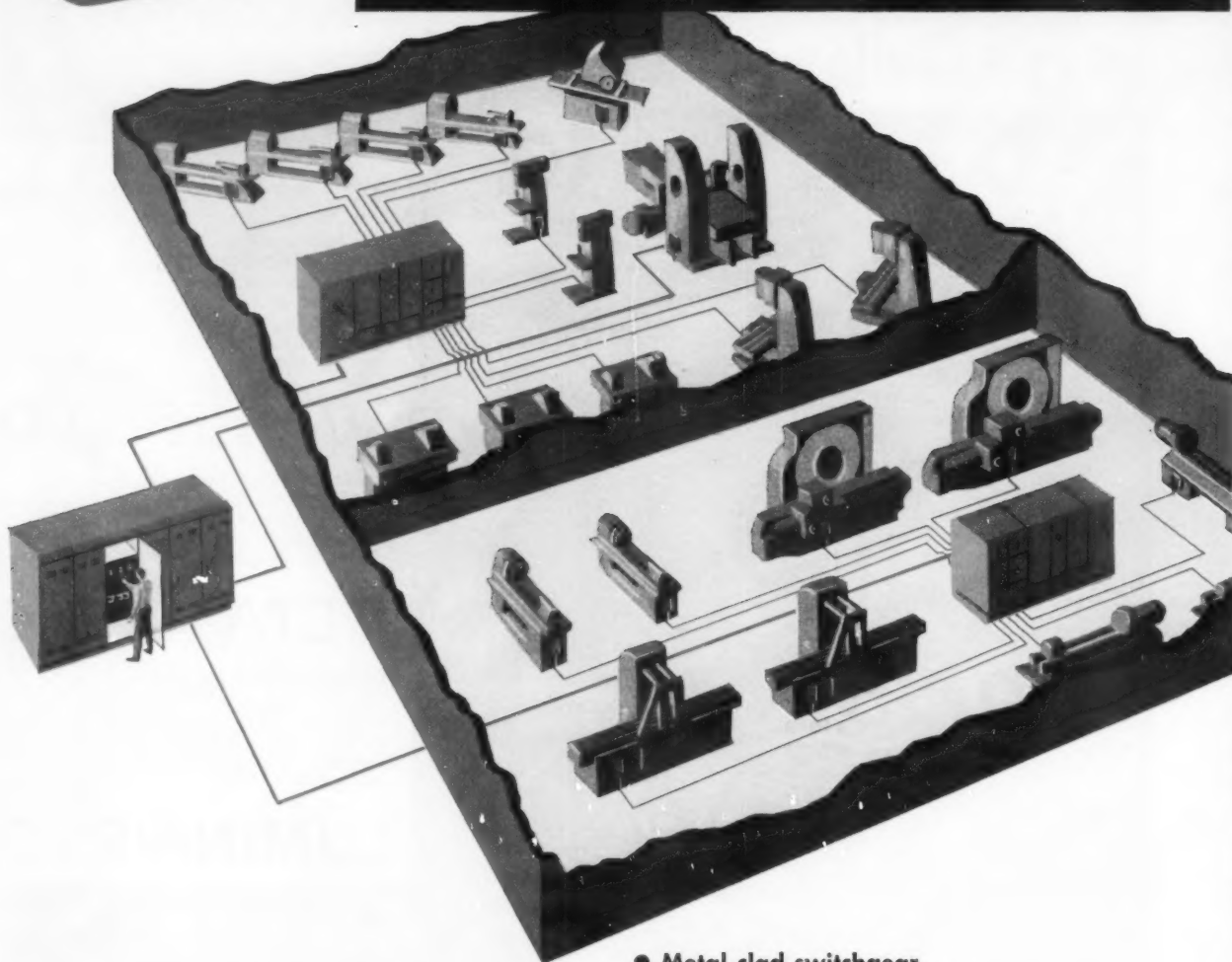


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Switchgear**

modernize



**MODERN PLANTS USE
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- Load center unit substations
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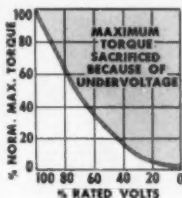
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Cut Operating Costs 6 Ways — Improve your Distribution System With Allis-Chalmers Switchgear

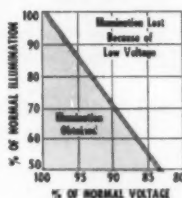
In many plants the electrical system grew piecemeal. New machines were added to existing feeders; long, low voltage feeders were added for new groups of machines — and the whole system became inefficient and even dangerous. If this is the case in your plant, here are some of the losses you can avoid by modernizing with Allis-Chalmers switchgear:



1 Torque loss — Torque and horsepower drop when voltage drops below rated voltage of motors. Jobs take longer, because reduced torque necessitates lighter cuts on machine tools. Major cause of undervoltage is long, low voltage feeders. Placing unit substations at load centers shortens low voltage cable . . . improves voltage.



2 Illumination loss — You get less lumens per dollar when voltage is low. In addition, most studies show workers see better, produce more when illumination level is high.



3 Production loss — Standard Allis-Chalmers switchgear designed to accom-

modate special circuit schemes that will assure uninterrupted power for automation or continuous processing.

4 Motor burnout — Individually enclosed low voltage circuit breakers at each machine protect motors from faults and from overloads that might cause burnouts . . . protects you from lengthy interrupted production.

5 Space loss — Compact Allis-Chalmers switchgear units fit anywhere. Use non-productive areas such as the roof, basement, balcony or space outside near the building.

6 Power loss — Old breakers in many plants are now inadequate to handle a short circuit because of increased system capacity since the time they were installed. A major fault could cause equipment failures and prolonged outages. If your plant is typical, any breaker over 10 years old is probably inadequate today, because of your increased use of power.

get more information



Allis-Chalmers switchgear engineers can help you solve your electrical distribution problems. Call your nearby A-C district office, or write for further information.

Allis-Chalmers Milwaukee 1, Wisconsin

A-4248

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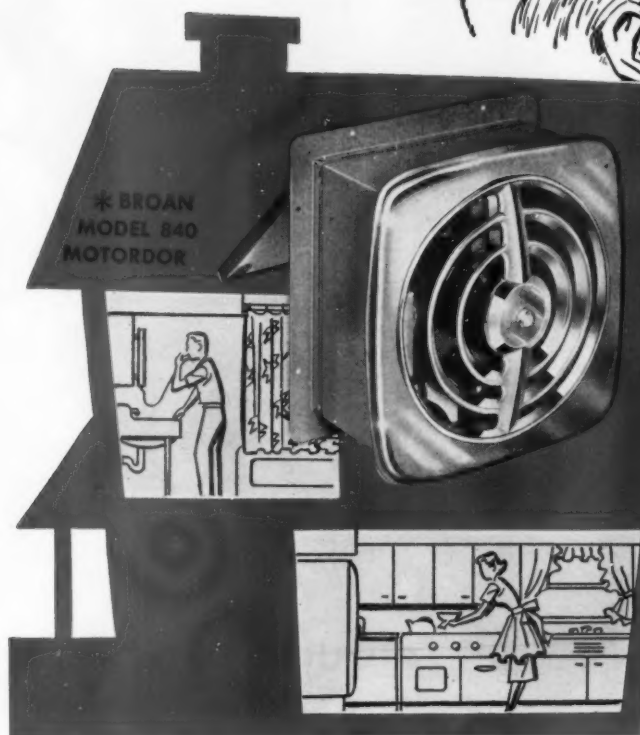


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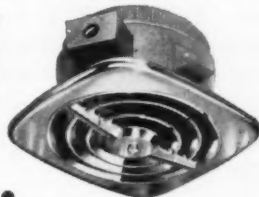
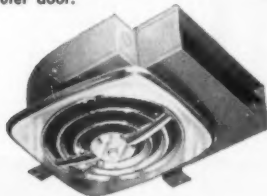


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The model you'll choose FIRST FOR CEILING USE because of its wide variety of possible installations, and its adaptability to ranch-style homes.

NEW Broan 8"

EXHAUST FANS . . . YOUR BIGGEST VALUE IN 8-INCH VENTILATING FANS

for bathrooms and small kitchens

Establishing new leadership in the 8" Ventilating Fan field, the BROAN line of 8" Exhaust Fans includes performance features and prices unmatched in the entire industry.

The exclusive "VENTURI-DESIGN" GRILLE provides not only the greatest possible volume of airflow from a 6-wing 8" fan but also a new experience in "whisper-quiet" operation. This new Grille is standard Equipment on all four 8" models — choice of Stainless Steel or White Enamel. A single thumb screw enables easy removal of grille.

In all models, the motors plug into convenient receptacles, for fast and easy removal when cleaning.

Sealed protection against back-drafts, cold-air penetration, and insects is provided on all four models.

Substantially lower installation cost is the result of a new Outer Flange which assures not only fast but also neat installation.

FREE CATALOG OF BROAN 8" FANS

BROAN MFG. CO., INC., 1677 N. Water St., Milwaukee 2, Wis.
Please send complete catalog information and prices of BROAN 8" Exhaust Fans.

Name

Address

City Zone State

Broan 8", 10" and 12" Exhaust Fans are America's most complete line of Residential Ventilating Fans.

**USED THE MOST
FROM COAST TO COAST**



For many years Contractors from Coast to Coast have used Briegel All Steel Indenter Fittings. U. L. approved as concretetight and for general use, B-M Indenter Fittings are faster, easier to use and neater in appearance.

Installation is simple and less expensive. Two quick squeezes sets them forever. Try B-M Indenter Fittings and get more profits from each job!



BRIEGEL **METHOD**
TOOL
CO.
GALVA, • ILLINOIS

Warehouse Stocks in Principal Cities for Immediate Delivery!

DON'T MISS THE BOAT...

enter Light's

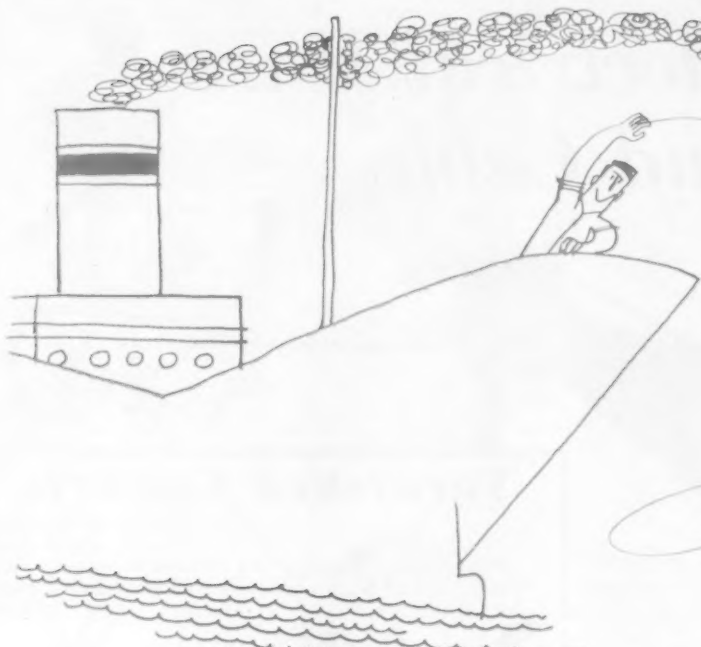
Diamond Jubilee

lighting competition

for

electrical

contractors...



... with one or more of the following types of lighting installations: Stores, Schools & Offices, Industrials, Residential, Floodlighting, Miscellaneous (hospitals, banks, lobbies, etc.)

- ★ \$1350 in cash awards
- ★ Publication of first prize winning entries
- ★ Free reprints of published first prize articles for local sales promotion

**ELECTRICAL
CONSTRUCTION
AND MAINTENANCE**



A MCGRAW-HILL PUBLICATION
330 WEST 42nd STREET, NEW YORK 36, N. Y.

Lighting Competition Chairman
ELECTRICAL CONSTRUCTION AND MAINTENANCE
330 West 42nd Street, New York 36, N. Y.

I'm not going to miss the boat. Send me the Rules Brochure and
Entry Forms.

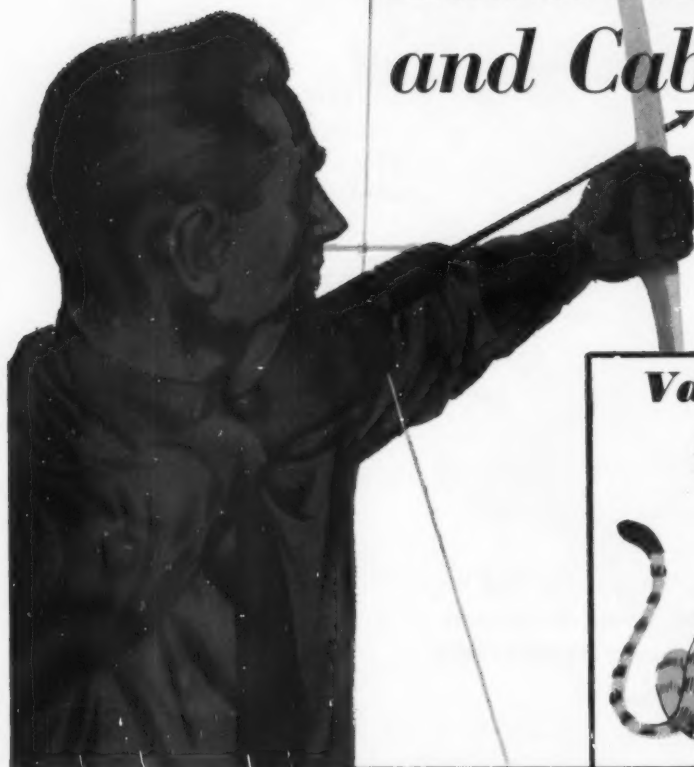
NAME _____

COMPANY _____

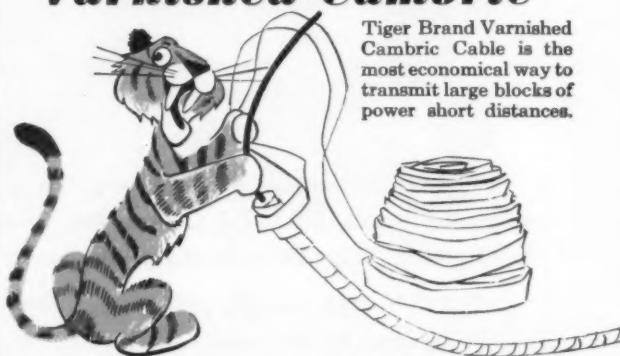
ADDRESS _____

CITY _____ ZONE _____ STATE _____

You just can't miss with ***Tiger Brand*** *Electrical Wire and Cable*



Varnished Cambric

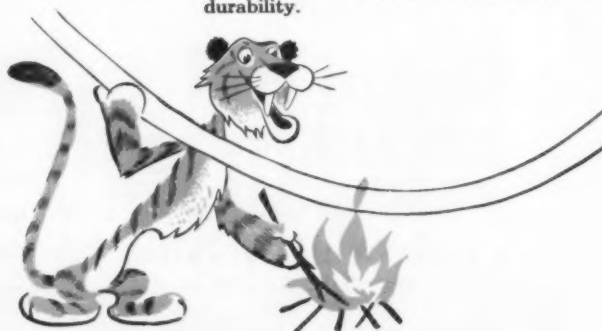


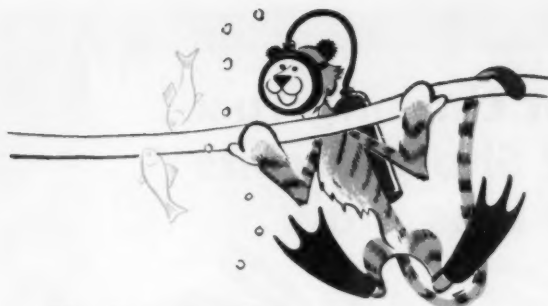
Tiger Brand Varnished Cambric Cable is the most economical way to transmit large blocks of power short distances.

Amerclad To withstand physical abuse, moisture, sun and oil, use Tiger Brand Amerclad for all sorts of portable equipment.



Amerbestos Tiger Brand Amerbestos is a true *quality* heat resistant material. The asbestos is felted for greater durability.

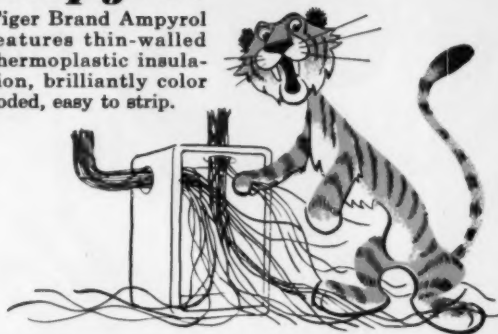




Submarine For underwater power distribution, there's a Tiger Brand Submarine Cable to withstand any operating condition.

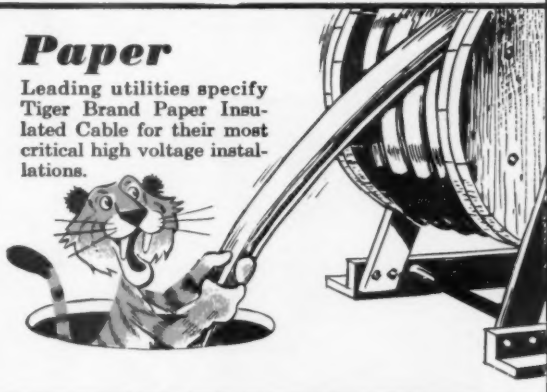
Ampyrol

Tiger Brand Ampyrol features thin-walled thermoplastic insulation, brilliantly color coded, easy to strip.



Paper

Leading utilities specify Tiger Brand Paper Insulated Cable for their most critical high voltage installations.



American Steel & Wire specializes in wire and cable that must withstand abusive service. No matter what kind of operating condition you may have, there is probably a *standard* Tiger Brand Wire or Cable that will give you better service than you ever dreamed of.

Send the coupon and outline your problem. We'll see that you get service—fast.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL CORPORATION, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

A STANDARD TIGER BRAND CABLE FOR EVERY SPECIAL JOB

- asbestos wire and cable
- mold cured portable cord
- aerial, underground and submarine cable
- shovel & dredge cable
- paper & varnished cambric cable
- machine tool & building wire
- special purpose wire & cable

SEND THE COUPON

American Steel & Wire
Room AE-84, Rockefeller Building
Cleveland 13, Ohio

- Please give me more information about Tiger Brand Wire & Cable for

Name

Firm

Address

City State

U-S-S Tiger Brand

**ELECTRICAL
WIRE & CABLE**



UNITED STATES STEEL



**Current Limiting Fuses
Clear Short Circuits
in Less than**

1/2 Cycle

**ALLIS-CHALMERS
Type H Starters**

**FOR 2300 TO 3000
VOLT MOTORS**

With Allis-Chalmers Type H Starters, your motors, cables and associated equipment are protected against short circuits by fast-acting current limiting fuses. These fuses cut off short circuit current at a *low safe peak value*. The short is cleared in less than a half cycle . . . thus minimizing the possibility of damage.

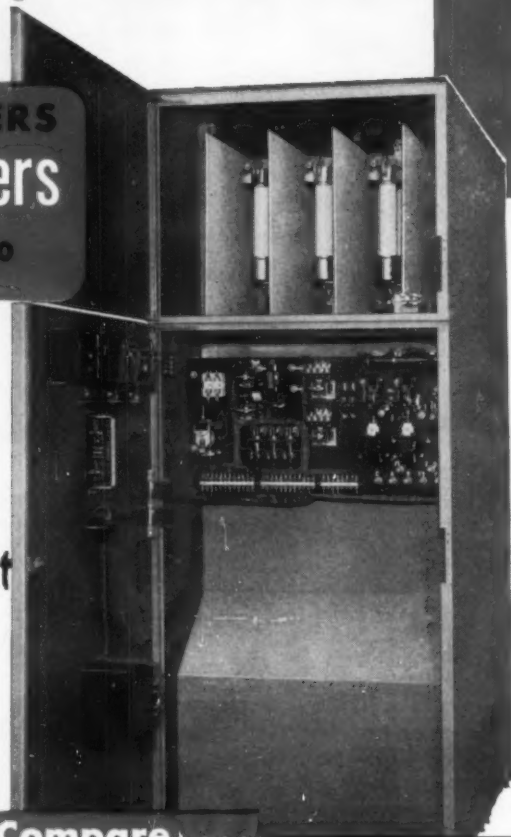
Noiseless, Safe, Positive

Action is silent. An indicator in the end of fuse reveals occurrence of short. Blown fuse emits no gas, flame nor vapor . . . discharges no metal. Flashover caused by ionized vapor is eliminated. Fuses will not blow unnecessarily . . . protection against locked-rotor or single-phase conditions is provided by overload relays coordinated with fuses.

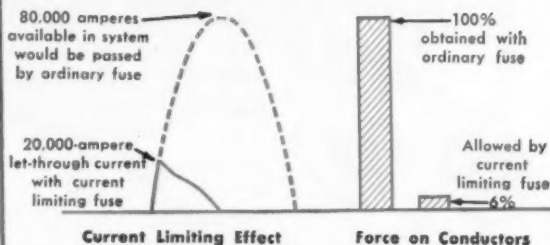
The FULL Protection Starter

Quick action short circuit protection is a part of the *Full Protection* engineered into a Type H starter . . . complete, positive protection which permits men to work in safety, guards motors and machines against costly damage, lengthens equipment life, increases production by reducing down time. Get all the facts from your nearby A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4368



Compare . . .



ALLIS-CHALMERS

Wanted: Dealers, Electrical Contractors to sell new Exide® LIGHTGUARDS®

Profits unlimited, tremendous sales potential. There are hundreds of money-making opportunities all around you to sell Exide Lightguard emergency lighting protection! Everywhere people gather there is a possible sale for Exide Lightguards. Send coupon now for full details.

YOU CAN CASH IN AS A DEALER

Power interruptions can happen anywhere, anytime, despite every precaution taken by utility companies. Every public gathering place needs emergency lighting—needs the protection of Exide Lightguard: Factories, Schools, Hospitals, Theaters, Restaurants, Hotels, Stores and Markets, Banks, Police Stations. *And as many as 200 Exide Lightguard units are deemed necessary by some industrial plants!*

YOU can quickly build extra profits for yourself.

Emergency lighting protection is now required by law in many cities and states—another reason Exide Lightguard units offer good sales opportunities for electrical dealers and contractors. Write for full details—the Exide Lightguard unit has many other easy-to-sell user benefits!

Here are money-making spots in your community:

SCHOOLS • HOSPITALS • HOTELS • CHAIN AND DEPARTMENT STORES • INDUSTRIAL PLANTS • RESTAURANTS • APARTMENTS • BANKS • CHURCHES • COMMUNITY CENTERS • INSTITUTIONS • LIBRARIES • OFFICE BUILDINGS • POLICE STATIONS

Lighting protection is needed for:

sales floors • open counter displays • cashier's cages • corridors • aisles • dining rooms • lobbies • boiler rooms • engine rooms • switchboard rooms • machine shops • payroll departments • loading platforms • bank vaults • auditoriums • exits • medicine rooms • firetowers • stairways • swimming pools • locker rooms • court rooms



Model M, double lamp unit

THE ONLY COMPLETELY AUTOMATIC EMERGENCY LIGHTING UNIT ON THE MARKET!

It operates instantly and automatically on any interruption to the normal A.C. power supply. Provision is made so that it automatically recharges itself upon restoration of normal power.

MAIL THIS COUPON NOW!

Exide INDUSTRIAL DIVISION

The Electric Storage Battery Company
Philadelphia 2, Pa.

Send me all the facts. I want to cash in on emergency lighting. Rush specifications, wiring systems, sales information on NEW EXIDE LIGHTGUARD UNITS.

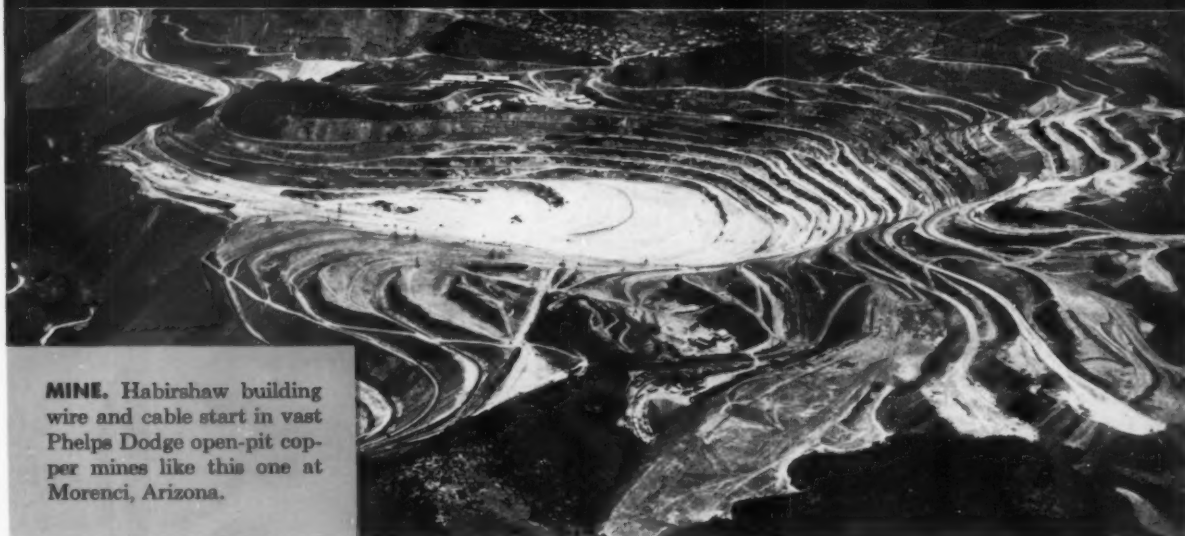
NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

My business is: ☐ Electrical Contractor; ☐ Consulting Engineer; ☐ Architect; ☐ Distributor; ☐ Dealer; ☐ Electrical Engineer; ☐ Other

When you need a dependable source



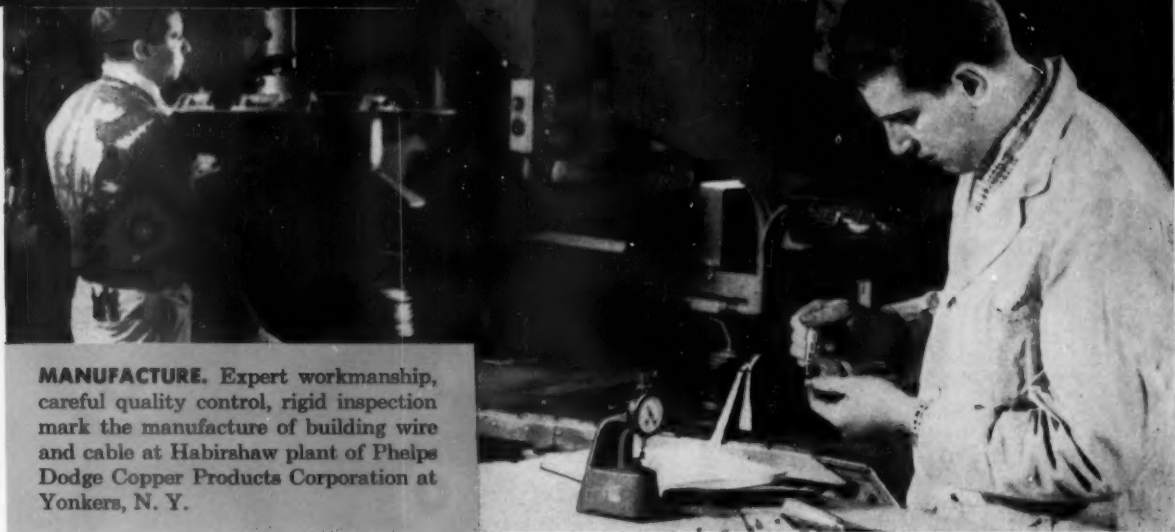
MINE. Habirshaw building wire and cable start in vast Phelps Dodge open-pit copper mines like this one at Morenci, Arizona.

IT PAYS TO SEE A PHELPS



MARKET. Delivery of Habirshaw building wire and cable by Phelps Dodge distributors to job site is final step in unified "Mine to Market" operation.

of supply...



MANUFACTURE. Expert workmanship, careful quality control, rigid inspection mark the manufacture of building wire and cable at Habirshaw plant of Phelps Dodge Copper Products Corporation at Yonkers, N. Y.

DODGE DISTRIBUTOR !

Phelps Dodge's complete "Mine to Market" program assures distributors dependable supplies and service

Here's what "Mine to Market" means to you:

- 1. A CONSTANT SUPPLY OF RAW MATERIALS.**
- 2. HIGHEST QUALITY WORKMANSHIP.**
- 3. PROMPT DELIVERY — all from one major source.**

Phelps Dodge distributors are an integrated part of this system, profit from working closely with a primary copper producer and fabricator.

PHELPS DODGE COPPER PRODUCTS
CORPORATION

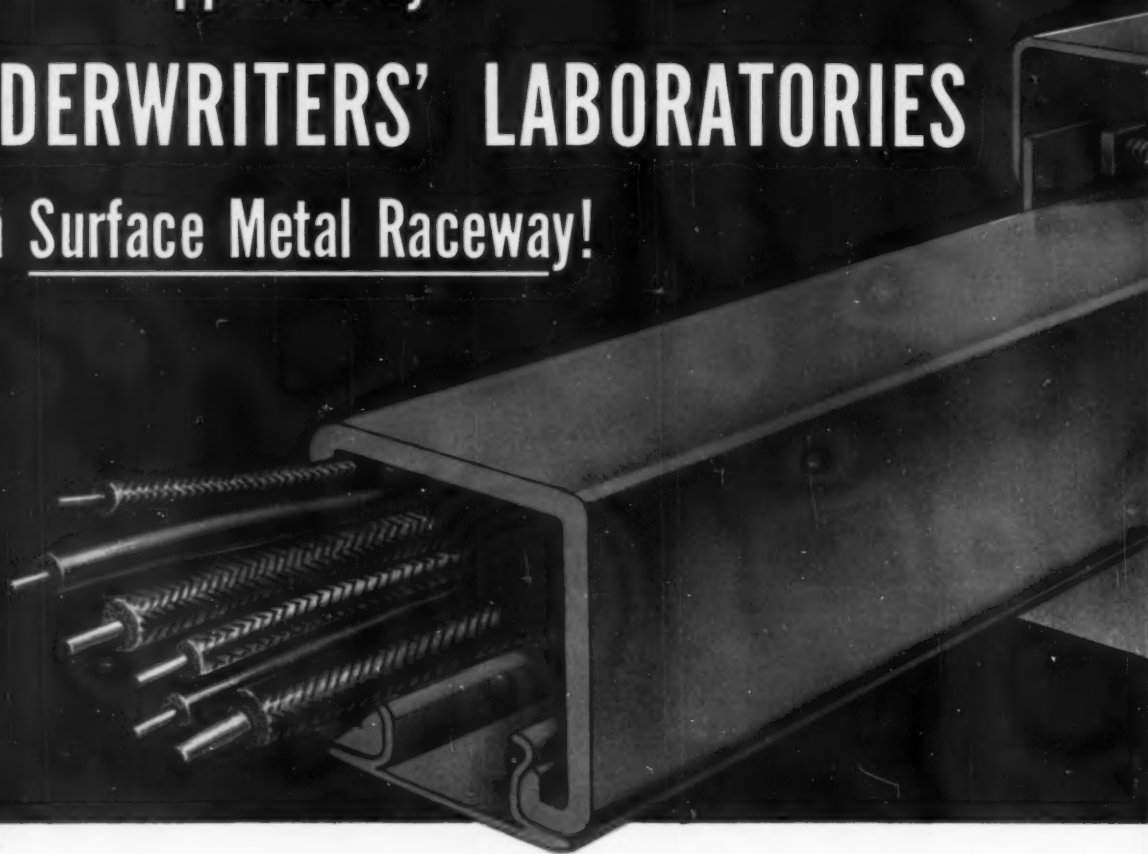
WIRE BY PHELPS DODGE MEANS WIRED FOR LIFE !

NOW! UNISTRUT® CHANNEL AND FITTINGS

approved by

UNDERWRITERS' LABORATORIES

as a Surface Metal Raceway!



In this building, UNISTRUT was used to support and wire a lighting installation on a concrete ceiling. Savings over conventional methods of installation were estimated at fifty per cent! Note the neat appearance and perfect rows of fixtures.



Lighting for a large manufacturing plant was solved fast at low cost by using UNISTRUT for support and wiring. Even on ceiling arrangements as this, using two types of fixtures, UNISTRUT installs quickly and easily.

Long popular as a quick-erected, low-cost method of lighting support, UNISTRUT channel and fittings have now been approved for use as a surface metal raceway...for wiring lighting installations and for supplementary power wiring of machines, motors, other lighting rows, etc.

Faster, Lower Cost Installation

The UNISTRUT system is quick and easy to erect from stock parts. No wire pulling necessary as wires are *laid in* the channel and closer strip snapped in place. Continuous channel support permits wider spacing of hanger stems, greatly simplifying installation and re-



U.S. Patent
Numbers
2327587
2329815
2345650
2363382
2380379
2405631
2541908
Other Patents
Pending

UNISTRUT GOES UP FAST FROM STOCK CHANNEL AND FITTINGS!



P-1000
12 gauge steel
1 3/8" x 1 3/8"

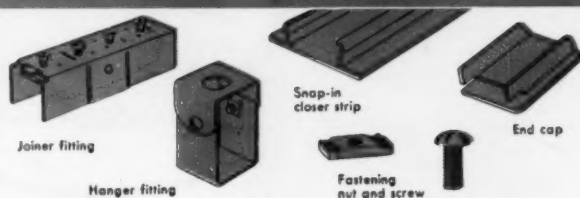
P-2000
16 gauge steel
1 3/4" x 1 3/4"

P-3000
12 gauge steel
1 3/4" x 1 3/4"

P-4000
16 gauge steel
1 3/4" x 1 3/4"

Four sizes of channel

UNISTRUT offers a choice of channel sizes for every type of lighting installation. Here you will find a size channel for weight and wire-carrying capacity to fit your particular needs.



Simple, standard fittings

These are the five basic fittings that form, with the channel, the UNISTRUT system of light support and wiring. Only a screw driver is needed to assemble the entire system.

ducing costs. Power lines tapped from the channel for supplementary wiring eliminate special lines and extra cost.

Neat Appearance, Complete Flexibility

Straight, strong and rigid, UNISTRUT channel gives lasting true alignment that's undisturbed by servicing. Concealed wiring eliminates unsightly external power lines. Fixtures may be attached anywhere along channel length...ideal for continuous run or spaced fixtures. Attachment of hanger stems at any point on channel permits quick, simple installations in spite of ceiling irregularities.

Ask to see the UNISTRUT
Demonstrator Car



The World's Most Flexible
All-Purpose Metal Framing



AVAILABLE NOW AT YOUR UNISTRUT DISTRIBUTORS

See your UNISTRUT Distributor for complete information on the UNISTRUT system of support and wiring, or ask to have a UNISTRUT Demonstrator car brought to your door. Warehouse stocks in all principal cities. In Canada, Northern Electric Company. For export, Pressed Steel Car Co., New York, N.Y. See your telephone directories.

Send for folder

Write today for free copy of bulletin FF-3 and Underwriters' Laboratories specifications.

UNISTRUT PRODUCTS COMPANY
1013 W. Washington Blvd., Dept. E-8
Chicago 7, Illinois

Name.....

Company.....

Address.....

City.....Zone.....State.....

dependable McGILL® lamp guards outlast all others

Here are two of the many McGill portable lamp guards that will withstand the hard wear and abuse of heavy industrial use. McGill 7000 and 650 series lamp guards last many times longer than ordinary guards because of exclusive design, heavier and better quality material and superior workmanship.

These models have pliable molded rubber handles and extra heavy steel wire cages that are electrically welded for strength and zinc plated with chrome finish to remain clean and bright for years. Sockets are 660 watt 250 volt, either plain or waterproof.

Such extras as cord seals, larger hooks and No-Rol ears to prevent cage rolling add to the safety and convenience of using dependable McGill portable lamp guards.

*heavy steel wire
electrically welded*

*proven dependable
Levolier® switch*

*rubber hook
handle*

Model 7000-SR with Rubber Handle, Reflector and Levolier Switch.

Model 650-SR with Curved Rubber Handle. This exclusive handle design permits hanging portable cage down so that light is free from any possible handle obstruction.

all are McGILL® quality



*Model 5000-SR
Convenience Outlet,
Reflector and Switch.*



*Model 5025-SLRG
Grounded
Concentrating Lens.*



*Model 3006
Vaporproof Guard.*



*Model 5500-SRG
Grounded, No Outlet,
Closed End Cage.*



Send for the new McGill Catalog No. 49-A describing the complete line of McGill Lamp Guards, Sockets and Switches.

McGILL MANUFACTURING COMPANY, INC.
450 N. Campbell St., Valparaiso, Indiana

McGILL®
electrical specialties



THE JOB...

Strip Mining

USE THE CABLE THAT FITS THE JOB!

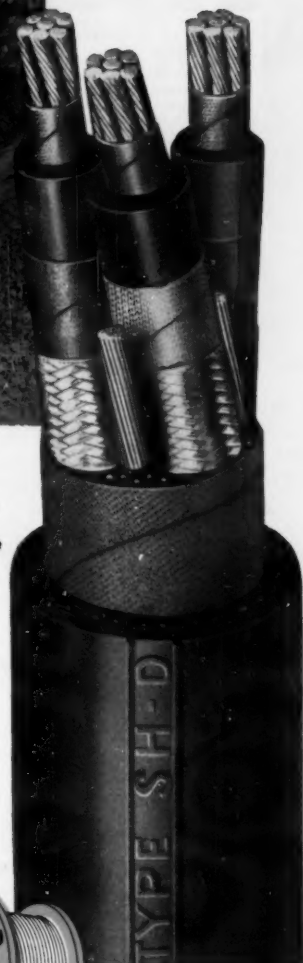
THE CABLE...

Hazacord Type SH-D Portable Cable

Ability to withstand extreme mechanical abuse and electrical stress is vital for long operational life in portable cables for shovels and drag lines. Hazacord Type SH-D Portable Cable combines the greatest electrical safety with maximum mechanical strength for long life and minimum outage in installations up to 15,000 volts.

Hazacord SH-D cables are protected by the mold-cured Hazaprene ZBF sheath with tire-tread toughness for extra mechanical strength. The copper shielding braid over each conductor, when properly grounded, equalizes electrical stresses and drains off all capacity-charging currents, insuring safety in handling. Grounding conductors in the interstices contact the copper shielding braid, providing an adequate low resistance ground for the equipment.

For information on this widely used design or on other portable cables, consult your Hazard representative or write Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pa.



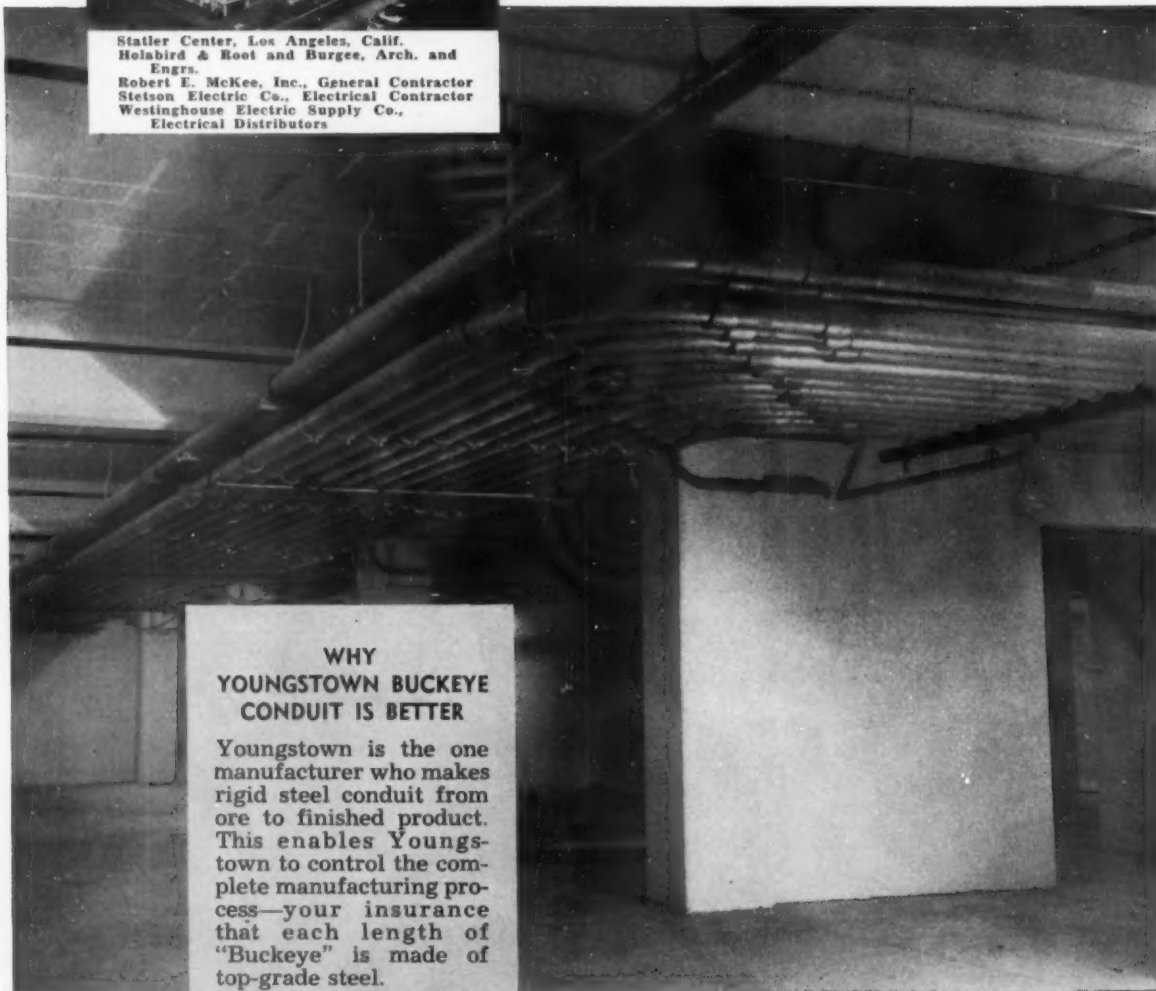
HAZARD
insulated cables

2137



Statler Center, Los Angeles, Calif.
Holabird & Root and Burges, Arch. and Engrs.
Robert E. McKee, Inc., General Contractor
Stetson Electric Co., Electrical Contractor
Westinghouse Electric Supply Co.,
Electrical Distributors

Youngstown Buckeye Conduit protects Statler wiring in L. A.



WHY YOUNGSTOWN BUCKEYE CONDUIT IS BETTER

Youngstown is the one manufacturer who makes rigid steel conduit from ore to finished product. This enables Youngstown to control the complete manufacturing process—your insurance that each length of "Buckeye" is made of top-grade steel.

Youngstown



●Years ahead in design and accommodations, the new \$25 million Statler Hotel in Los Angeles installed Youngstown Rigid Steel Conduit to protect wiring throughout its 13 stories. For the future, management can be sure that the electrical systems will be safe—adequately guarded against those enemies of all wiring jobs—water, moisture, vapors, dust and dirt.

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of
Carbon, Alloy and Incoloy Steel

General Offices: Youngstown, Ohio - Export Office: 500 Fifth Avenue, New York 36, N. Y.

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT
AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - BAR SHAPES - WIRE -
HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - RAILROAD TRACK SPIKES



Here's a new line of... **DELCO**

OPEN BALL-BEARING MOTORS

Corrosive-resistant cast iron frame. Exclusive cotton and varnish insulation for permanent flexibility and long life.



Grease-lubricated shielded and sealed ball bearings are positioned to maintain permanent shaft alignment.

Rotor is die-cast aluminum, dynamically balanced in unit with shaft to reduce vibration.



New NEMA frame sizes—the major design feature of these greatly improved Delcos—offer users more power in less space, with less noise, less weight, and better appearance. Yet with all these new advantages, there's no sacrifice of performance or electrical characteristics! These are the motors you can order *now* in frame sizes 182 and 184—and get in a hurry. Larger frame sizes—to 326—will be available later. Also, there are new totally-enclosed fan-cooled motors in frame sizes 182 and 184 available now. These two new lines are compact . . . lightweight . . . quiet.

Previous frame sizes will continue to be available



DELCO PRODUCTS

DIVISION OF GENERAL MOTORS CORPORATION
DAYTON 1, OHIO

A GENERAL MOTORS PRODUCT

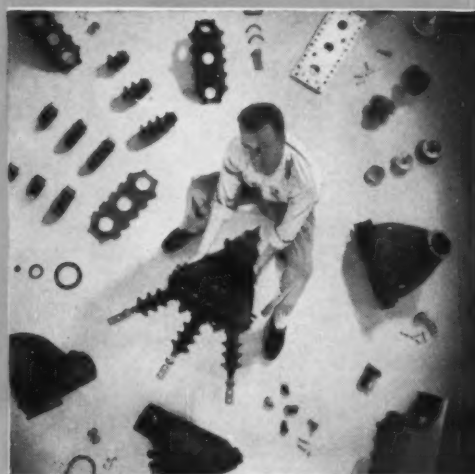


A UNITED MOTORS LINE

DISTRIBUTED BY WHOLESALERS EVERYWHERE

This New Anaconda Catalog Puts

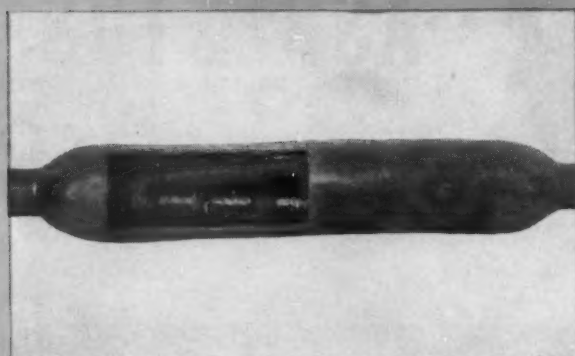
The right cable accessory



POTHEADS. A complete line engineered by power-cable experts for use with *any* make cable. Parts are *fully* interchangeable for greater adaptability, faster delivery, easier installation and lower costs. Anaconda supplies both gasket and soldersealed types.



...at your finger tips



F-3* ALLOY-LEAD JOINT SLEEVE. F-3 has higher tensile strength, lower creep rate, greater bursting strength, and higher resistance to bending fatigue and vibration. Furnished with jointing kit when specified.

*Reg. U. S. Pat. Off.



JOINTING KIT. Your cable-installation crews have everything needed new and clean for a specific joint. Materials are always on the spot. Never forgotten. Never left behind. Kits assure neat, lasting job.



FILLING COMPOUNDS. A group of compounds both plastic and fluid to meet every need: for paper-, varnished-cambic and rubber insulated cable joints and potheads for voltages up to and including 69kv.



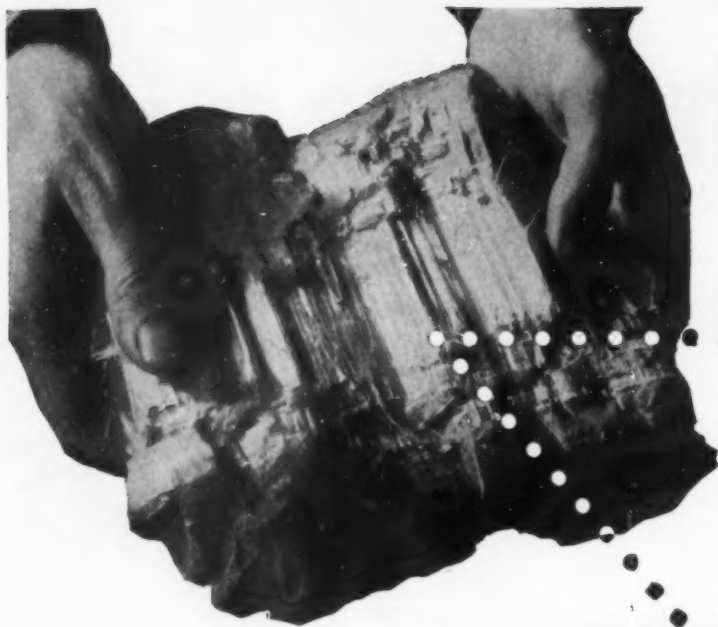
Free —

Cable Accessories Catalog No. C-79-13-14. The most comprehensive book on cable accessories ever published. Simplifies selection and ordering of the right item for every job. A copy is yours for the asking. Write **Anaconda Wire & Cable Company**, 25 Broadway, New York 4, N. Y.

54549

ANACONDA®

**where cable accessories
are made by cable experts**



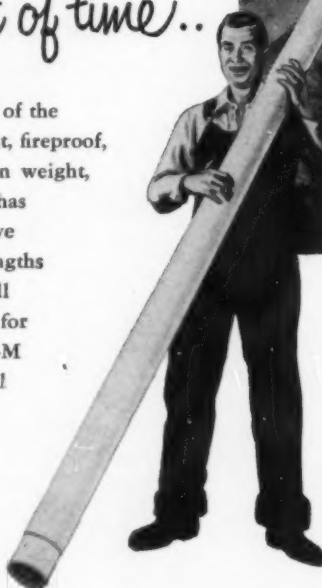
From the
magic mineral
ASBESTOS

come these strong, durable

TRANSITE DUCTS

*made to stand
the test of time..*

Transite* meets every requirement of the ideal duct material. It is permanent, fireproof, corrosion resistant, strong, light in weight, smooth-bored, non-inductive, and has rapid heat dissipation. No protective coating is required. The 10-foot lengths are rapidly assembled. Transite will outlast other duct materials. Write for new, free brochure showing how J-M Transite Ducts can effect substantial savings in both installation and maintenance of cable subways. Address Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay St., Toronto 1, Ontario.



Available In Two Types:

TRANSITE CONDUIT

Thick walled, used for exposed work, or buried without concrete casement saves time, labor, materials.

TRANSITE KORDUCT

Thinner walled for installation in concrete. Used for high-voltage lines, its high thermal conductivity cuts operating losses.



Johns-Manville

*Trade mark registered

NEW FRACTIONAL H.P. MANUAL STARTER HAS ALL THE FEATURES!



right:
Class 2510
Basic Starter Mechanism

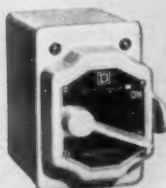
DESIGN LEADERSHIP IN THESE FEATURES:

- ✓ Quick-make, quick-break contact mechanism
- ✓ Single or double pole construction
- ✓ Double break contacts of fine silver
- ✓ Modern styling
- ✓ Straight-through wiring with convenient terminals—generous wire space
- ✓ Dependable melting alloy type overload protection—trip-free
- ✓ Definite trip indication
- ✓ Interchangeable overload relay units accessible from the front
- ✓ Open type starter can be used with standard switch box and flushplate

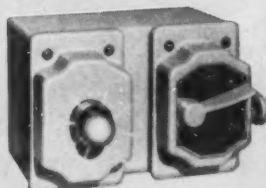
a Variety of Enclosures



General purpose enclosure—with or without pilot light



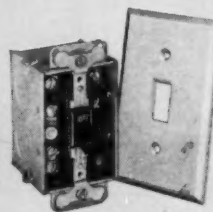
Water-tight and dust-tight enclosure



Water-tight and dust-tight with pilot light



Explosion-resisting enclosure. For hazardous locations—Class I Group D and Class II Groups E, F and G.



Flush mounting. Basic starter mechanism can be used with standard switchbox and flush plate—or with flush plate only for machine tool cavity mounting.

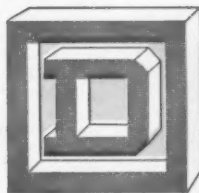
RATINGS

Double pole
1 H.P., 115-230 volts
A.C. or D.C.

Single pole
1 H.P., 115-230 volts A.C.
and 1/2 H.P.,
115-230 volts D.C.

Write for Bulletin 2510A. Address Square D Company, 4041 N. Richards St., Milwaukee 12, Wisconsin.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS



SQUARE D COMPANY

6 Reasons Why . . .

G-E MANUAL STARTERS GIVE MAXIMUM

INSULATED BASE.

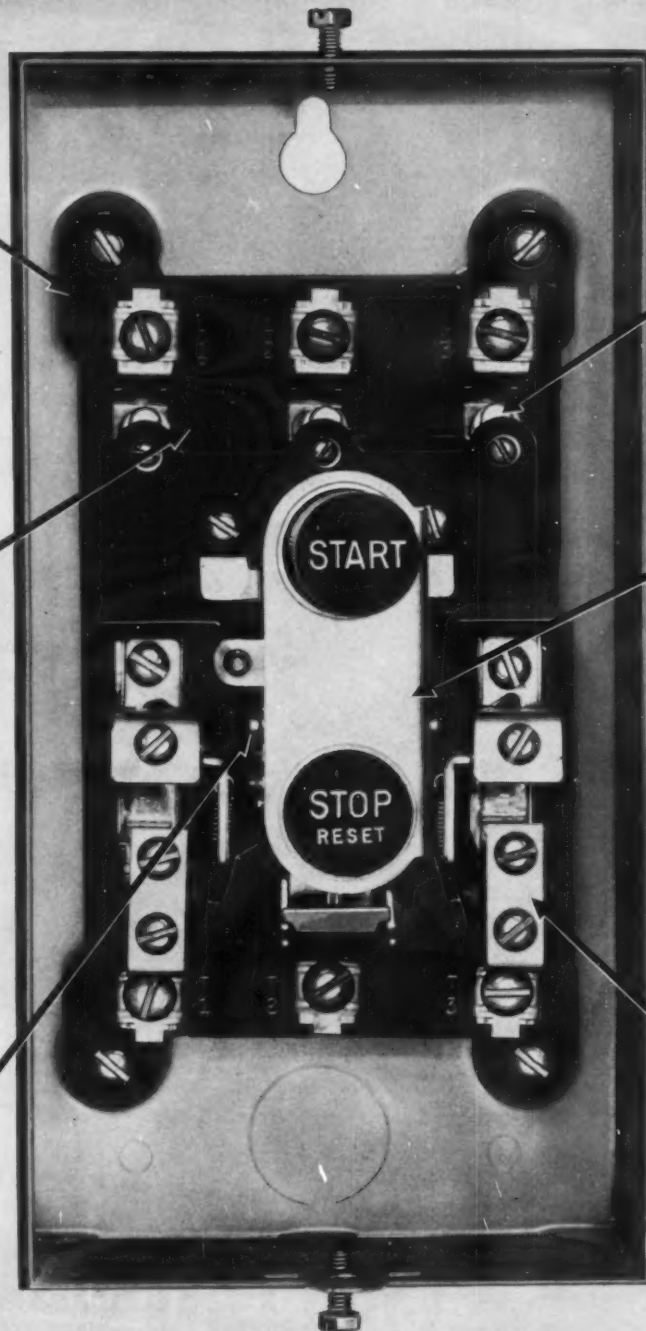
The starter's molded insulated base provides maximum protection from grounding. Barriers to isolate contacts and reduce arcing are made from hot molded material which doesn't absorb moisture. They have sufficient protection against arc-overs, and also act as mounting supports for the switch.

ARC PROTECTION.

Arcs are completely confined, even with maximum horsepower and stalled rotor current, in deep insulated wells. This feature provides a high safety factor by reducing the possibility of arc-over between adjacent contacts and results in increased contact life.

SAFE FROM VIBRATION.

The snap-action switch mechanism is built so it cannot accidentally trip from machine vibration. Both push button and lever types help protect against inadvertent operation. Guard on toggle-type switch cover prevents accidental tripping, yet is large enough for operation by a gloved finger. The handle guard provides a means for padlocking switch in either ON or OFF position. For fractional horsepower motor switches, a new handle guard incorporating these safety features is available.



SPLIT-SECOND BREAK.

Operating mechanism is spring-loaded for split-second breaks which reduce possible arcing and contact freezing. Made of fine silver, contacts give years of make and break operations. Large contact surface assures positive contact on make.

TRIP-FREE MECHANISM.

On G-E manual starters, the operating mechanism trips free on overload, opening the contacts. This action makes it impossible for the switch to be held closed under injurious overload conditions. Visual indication is given by the lever or push button in the neutral position.

NO INJURIOUS OVERLOADS.

Bi-metallic overload relays allow your motor to deliver maximum power without premature tripping, yet help protect against overloads and stalled rotor conditions. This positive protection helps prevent damage to the motor due to heating. Bi-metallic overload relays, unlike the solder-pot type, can be mounted in any position. Easily installed heaters are available in all ratings.

PROTECTION

Maximum protection, inside and out, is provided by G-E manual starters. In addition to the features illustrated at left, protective devices have been built into the enclosure itself. Provision has been made for padlocking starter cover (toggle types may also be padlocked in ON or OFF position) to help protect personnel.

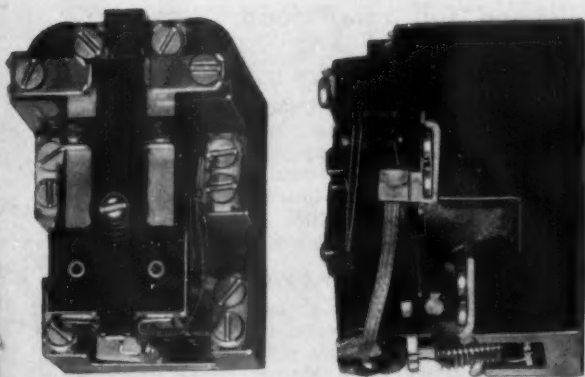
ADDITIONAL FEATURES of G-E manual starters include front-connected, clamp-type terminals; straight-thru wiring; general purpose, water-tight, dust-tight and explosion-proof enclosures; clearly marked line and load terminals; and operating mechanisms that are replaceable as units.

FOR MORE INFORMATION contact your nearest G-E Sales Office, or Distributor, or write Section 730-54, General Electric Company, Schenectady 5, N. Y. Ask for Bulletin GEA-1522.

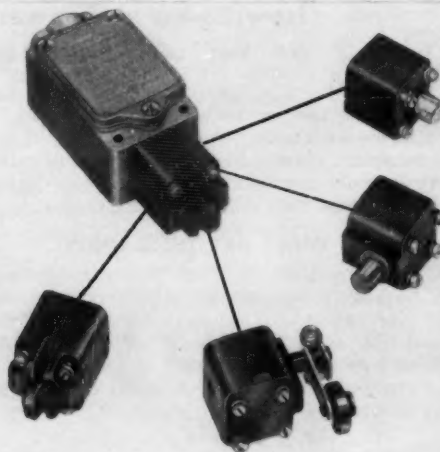


EASILY ACCESSIBLE MOUNTING KNOCKOUTS in top, sides, bottom and back of case simplify installation. Knockouts are punched for $\frac{1}{2}$ or $\frac{3}{4}$ inch conduits. Straight-thru wiring, adequate wiring space and saddle-type clamping terminals make wiring easy.

DEPENDABLE RELAYS, LIMIT SWITCHES FOR VARIED APPLICATIONS



Small size, general-purpose relays are high current rated. Both a-c and d-c forms are available in ratings up to 300 volts. The new, strong, long-life shunt assures dependable relay performance.



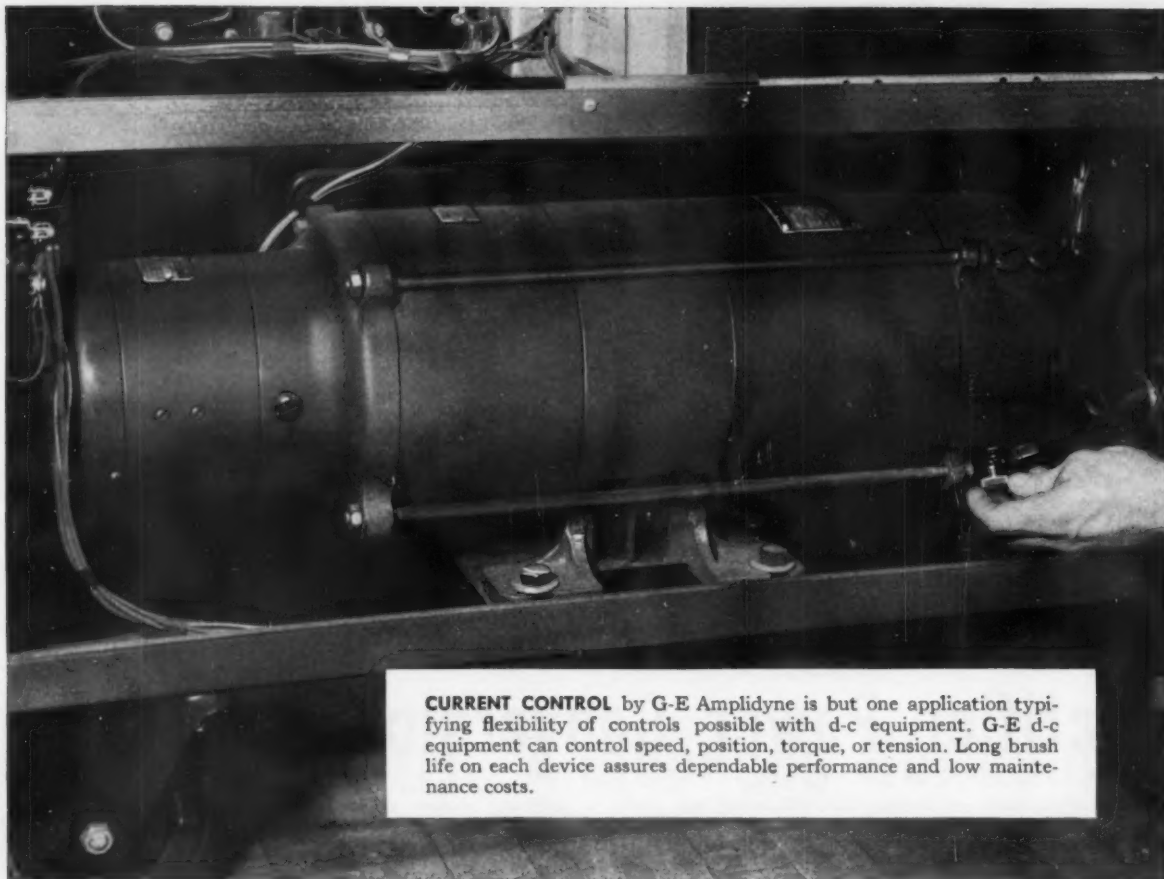
Compact, track-type limit switch has four interchangeable heads: roller lever, side pushrod, top pushrod, and roller pushrod. Heads mount in any of four 90-degree operating positions.

CHOOSE FROM THE COMPLETE GENERAL-PURPOSE CONTROL LINE



MANUAL STARTERS — MAGNETIC STARTERS — PUSH BUTTONS — COMBINATION STARTERS — RELAYS — REDUCED VOLTAGE STARTERS — SOLENOIDS — LIMIT SWITCHES

GENERAL  ELECTRIC



CURRENT CONTROL by G-E Amplidyne is but one application typifying flexibility of controls possible with d-c equipment. G-E d-c equipment can control speed, position, torque, or tension. Long brush life on each device assures dependable performance and low maintenance costs.

Use G-E amplidynes for accurate process control


G-E AMPLIDYNES, like the one shown above, are versatile d-c power amplifiers with near-instantaneous response—designed to give fast, accurate control of position, current, voltage, speed or tension.

Versatility of d-c equipment gives you more effective and economical use of your expensive production machinery. For example, wide speed range is readily available because of the adjustable-speed characteristics of direct-current

motors; other G-E d-c products like amplidynes, tachometer generators, motor-generator sets, and Thy-mo-trol* drives can help you solve even more production problems.

APPLICATION ENGINEERS at G.E. are anxious to help you get efficient control systems. For more information on this service and on d-c equipment, see your local G-E Apparatus Sales Office or Authorized G-E Distributor. General Electric Company, Schenectady 5, N. Y. 704-12

*Reg. Trademark of General Electric Co.

You can put your confidence in—
GENERAL  ELECTRIC

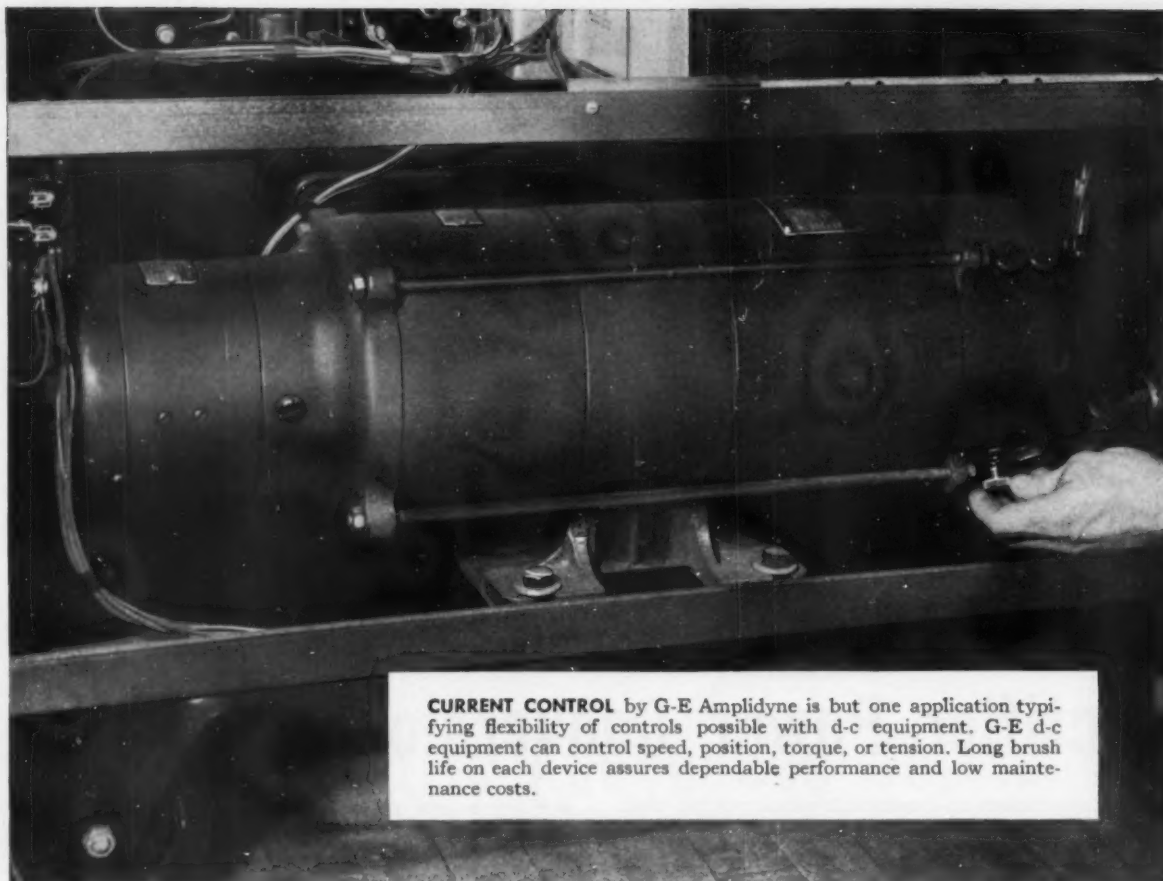


ANHYDREX *The cable* *with the built-in Galoshes..*

Snow, slush, and rain call for galoshes. You might catch pneumonia if you leave them home. Your power cables need galoshes, too. They can't catch pneumonia, but if they get wet enough they'll eventually need expensive doctoring. ● Simplex-ANHYDREX Cable has those galoshes. They're built-in in the form of Anhydrex insulation. Anhydrex insulation is guaranteed not to absorb more than 20 milligrams of distilled water per square inch after 7 days' immersion in 158° F. (70° C.) water. It is the most stable rubber insulation when exposed to water and moisture. ● Besides its notable low water-absorption characteristics, Simplex-ANHYDREX Cable is unaffected by summer heat and winter cold. It won't crack under vibration and is highly resistant to acids, flame, grease, and oil. ● Your Simplex representative has more information about the cable with "the built-in galoshes" — Simplex-ANHYDREX Cable. Ask him about it.

***Simplex*—ANHYDREX**
SIMPLEX WIRE & CABLE COMPANY

79 Sidney St., Cambridge 39, Massachusetts



CURRENT CONTROL by G-E Amplidyne is but one application typifying flexibility of controls possible with d-c equipment. G-E d-c equipment can control speed, position, torque, or tension. Long brush life on each device assures dependable performance and low maintenance costs.

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*Reg. Trademark of General Electric Co.

You can put your confidence in—
GENERAL  ELECTRIC



ANHYDREX *The cable* *with the built-in* Galoshes..

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Simplex—ANHYDREX

SIMPLEX WIRE & CABLE COMPANY

79 Sidney St., Cambridge 39, Massachusetts



Facts you should

Rome Aluminum Triplex offers savings up to 30% and better



Here is one of those rare opportunities for you to save real money, yet get maximum performance and improved appearance.

You save up to 30% and better over conventional Type SD service cable when you install Rome Aluminum Triplex Service Drop and Secondary Cable.

First you save on initial cost. Then you save time on installation because of lighter weight and less handling. For secondaries that means you can string longer spans with fewer poles. It is possible to use mid-span taps. You may eliminate crossarms, messenger rings, and use a minimum of hardware.

You save, too, on maintenance and service interruption because Rome Aluminum Triplex offers maximum resistance to storms, wind and ice loading as well as other exposure elements.

Its RoPrene (Neoprene) or RoLene

(polyethylene) insulations protect against sunlight, heat, moisture, corrosive atmospheres and other operating hazards. There are no braids to rot or festoon. Conductors are more accessible because they have no common covering.

Better Performance

In addition to savings, you get better voltage regulation because of lower reactance in long and heavily loaded circuits. And finally you have a neater, cleaner installation...no cluttered, unsightly open wires.

For full information on Rome Triplex with copper or aluminum conductors send for Rome Bulletin RS-5 which gives specifications, dimensions, sag and tension data, and installation tips.

New 500-foot carton makes handling easier



Rome Aluminum Triplex can now be purchased in handy cartons of 500-ft. coils. Carton size assures easy storage and handling. Center knockout simplifies cable removal. This cable is also still available on 1,000-ft. reels.

know about Rome Aluminum

Tips

on Connecting Aluminum

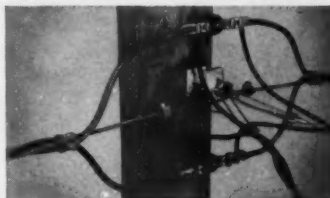
1. Clean surface of aluminum conductors thoroughly before making connection.
2. Use a liberal coating of compound on all joints and connections.
3. Do not use solder for joining conductors — pressure-type connectors are preferable.
4. Connector material should be aluminum or aluminum alloy. Where aluminum to copper connections are involved, a copper or copper-alloy insert permanently bonded to the over-all aluminum connector has proven generally satisfactory.
5. Protect finished joints from air and weathering by covering with compound, or other suitable material.



New Rome ACSR provides dependable operation

If you are planning new overhead distribution lines, it will pay you to specify Rome ACSR. Carefully controlled manufacture and testing of this product assure exceptional uniformity and dependability.

Typical service connections



Typical service tap connection at pole.



Typical dead end connection at house.



Fewer poles, longer spans with mid-span taps possible on secondaries.

Weatherproof Wire

Regularly supplied with solid or stranded all-aluminum or ACSR conductors, covered with RoLene or RoPrene. Conventional URC triple braid covering can also be supplied.

New spin-casting wheel helps assure controlled methods

Rome Cable is one of the few manufacturers of aluminum conductors to use the famous Properzi casting wheel.

Molten aluminum is transferred to the casting wheel. Flowing in the groove of the wheel, sealed by a continuous band, the solidified aluminum emerges as a triangular cast shape.

A casting method such as this, plus careful, scientific compounding and application of insulating materials, permit Rome to control the quality of its aluminum products throughout every step of their manufacture.



In addition, thorough chemical and metallurgical research, plus extensive testing that is independent of production and sales, are your assurance of safety and long-lasting economy when you specify Rome aluminum wires and cables.

Send for your copy of Bulletin RS-5 on copper and aluminum self-supporting service drop and secondary cables.



Rome

It Costs Less to Buy the Best

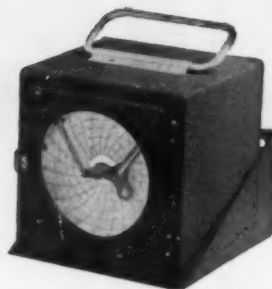
ALUMINUM

ROME CABLE CORPORATION, ROME, N.Y., AND TORRANCE, CALIF.

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . AUGUST, 1954

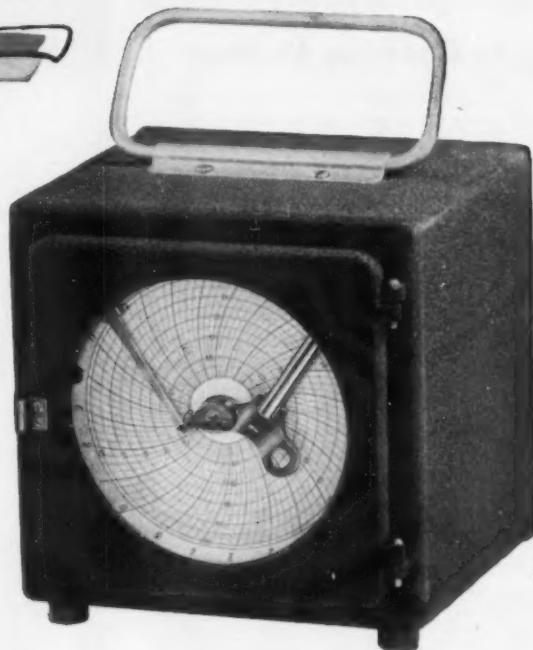


New



WESTON miniature Electrical Recorder

**EXTREME COMPACTNESS...CORMAG®
SELF-SHIELDING MECHANISM...
A-C AND D-C MODELS**



Employing the Weston CORMAG mechanism, this new recorder combines a high degree of shielding with new compactness and light weight. For example, the magnetic field created by a conductor carrying 15,000 amperes at a distance of 3 feet would cause a temporary error of less than 1 per cent. Over-all size is only 6¾" x 6¼" x 7" deep; chart size 4" dia.; weight only 1½ lbs.

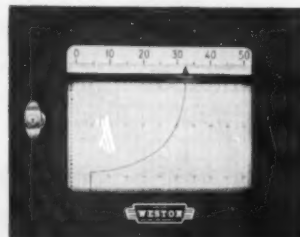
It's the ideal instrument for recording ampere-hour demand—checking overloads or unbalanced conditions—monitoring radio detectors—recording current and duration in electroplating and metal refining—recording speeds—making life tests on batteries, lamps, etc.

Available in required ranges for A-C or D-C voltage or current measurement needs. Also furnished with bracket for wall mounting; and with flange case for flush panel mounting. Bulletin available giving complete specifications and prices . . . WESTON Electrical Instrument Corporation, 614 Frelinghuysen Avenue, Newark 5, New Jersey.

7553

WESTON SIMPLIFIED RECORDING POTENTIOMETER

Sets a new standard for sound, simplified design—for simplicity and economy of maintenance—for sustained high accuracy and dependability. Ranges changed simply by inserting required range standards. Chart speeds changed by simple screwdriver adjustment. All features described in bulletin. Send for your copy.



WESTON

Instruments



BUILDERS ARE PRESOLD ON *Stab-lok*...

it's a "millions-proved" sales feature

YOU DON'T have to talk an arm off a builder to sell him Stab-lok Circuit Breakers. Builders are already sold. They've found that modern circuit protection really helps sell homes...and that Stab-lok costs only pennies more than fuse boxes. Besides that, Stab-lok dependability is unquestioned. More Stab-loks are being installed today than all other breakers combined...millions of them are in service.

And as if that weren't enough, look at these other Stab-lok advantages!

Across-the-board economy—Stab-lok costs less when you buy it; less to install; less when you have to change or add circuits.

Widest line of enclosures—Stab-lok enables you to meet

every sort of specification for circuit breaker protection.

Amazing flexibility—Magic "E" and sequenced bussing, plus the standard NA, the half-inch NC, and the double pole (simultaneous trip) Stab-lok breakers provide flexibility unapproached by any other system.

Nationwide distribution—No matter where you're located, Stab-lok breakers and enclosures are available at nearby jobbers' for immediate delivery.

Sell Stab-lok to all your prospects...and remember builders are the biggest buyers! And write for the Magic "E" booklet that brings the whole Stab-lok story up to date. Federal Electric Products Company, 50 Paris Street, Newark 5, New Jersey.



FEDERAL & PACIFIC

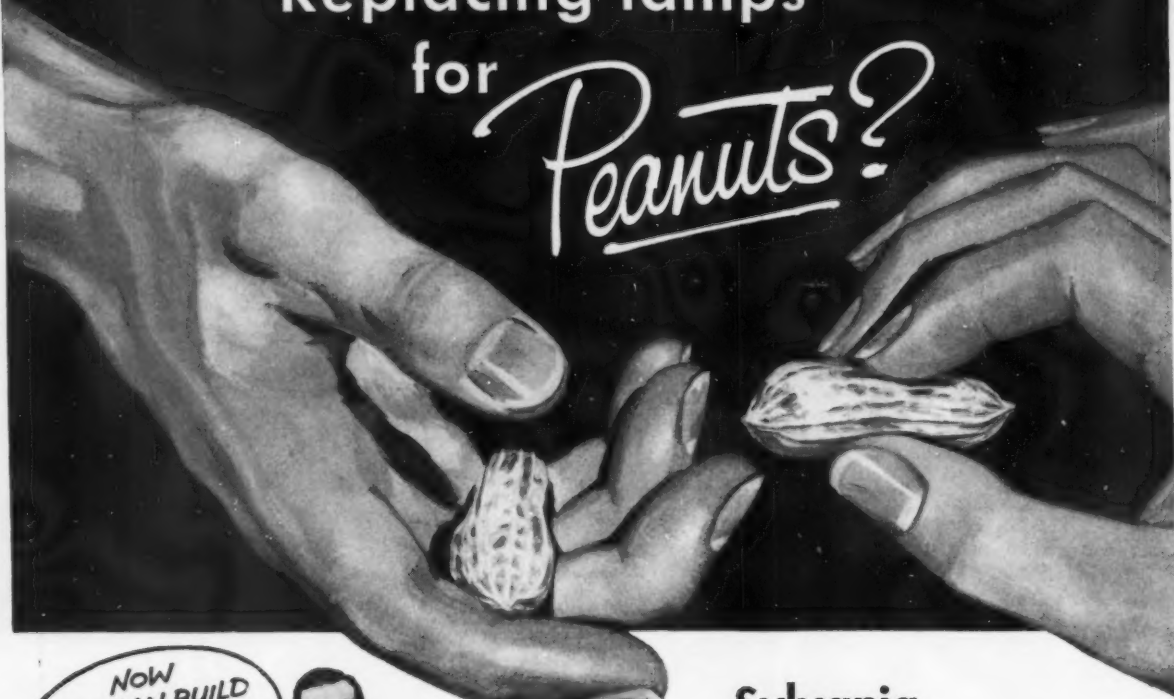
ELECTRIC PRODUCTS COMPANY

ELECTRIC MANUFACTURING CORP.



Federal products: Stab-lok Circuit Breakers, Motor Controls, Safety Switches, Service Equipment, Industrial Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct — **Pacific Electric products:** High voltage circuit breakers and power switches ★ Sales offices in principal cities.

Replacing lamps for *Peanuts?*



NOW
YOU CAN BUILD
MORE BUSINESS
AND GOODWILL
TOO!



Sylvania
offers you a **PROFITABLE**
Lamp Replacement Program!

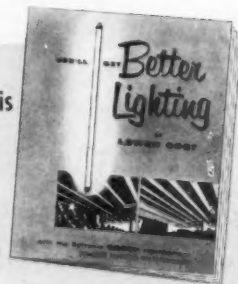
You're right, there's *not* a great deal of profit in selling and installing a few fluorescent lamps at a time. BUT, there's a *whale* of a good profit in replacing 500 . . . or 1,000!

You get this "Plus Lamp Business" with the Sylvania Fluorescent Lamp Group Replacement Program.

By this plan you replace a customer's fluorescent lamps as a group . . . before burnouts become an expensive nuisance. This method saves him maintenance and labor costs, and reduces costly work interruptions. And, it assures better light for better production, better morale and appearance.

New illustrated booklet explains exactly how and why this Sylvania plan can build extra profits and good-will for you. For your copy address Dept. 4L-2408, Sylvania today!

Send for this
important
booklet
TODAY!



SYLVANIA

Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y.

LIGHTING • RADIO • ELECTRONICS • TELEVISION

In Canada: Sylvania Electric (Canada) Ltd., University Tower Bldg., St. Catherine Street, Montreal, P. Q.



METALCLAD SWITCHGEAR

Cuts Cost of Power System in New Motorola Plant

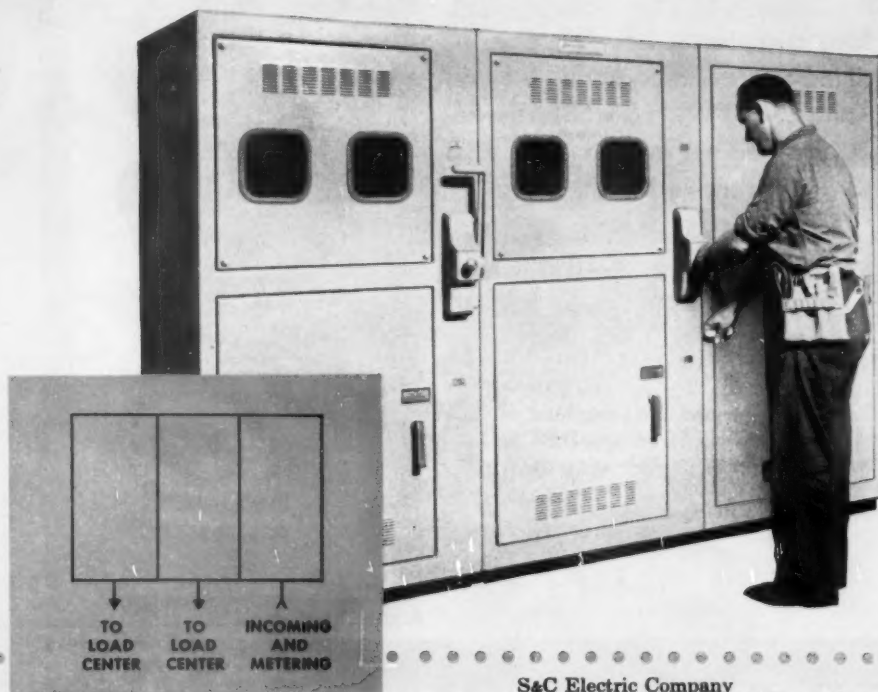
Reviewing original proposals for Motorola's new assembly plant, Crescent Engineering Co.—contractor-engineers of Chicago—recommended installing a high-voltage power system to trim material and operating costs. Choosing S&C Metalclad Switchgear to protect and switch the feeders, they reduced high-voltage equipment costs by one half.

To get the most from your construction budget, specify S&C Metalclad Switchgear. Whether your plans for high-voltage power supply are tentative or settled, you can materially reduce your equipment costs with S&C. For booklet containing complete information, send coupon below or address request on company letterhead.



Mr. John J. Chapp

President of Crescent Engineering Co. suggested a high-voltage power system with S&C gear to help trim Motorola's construction budget. He says, "Since we engineer every job on which we work, we *must* select equipment that will provide our customers with the best possible service. Our years of experience have shown us that S&C Metalclad Switchgear meets our quality standards and provides lasting, dependable service."



Power is taken in and metered at 4160 volts in the first bay on the right. The following two bays provide protection and switching for the feeders, the center bay serving the fire pump for the sprinkling system, and the left-hand bay supplying load centers in the process and storage areas of the plant. Provisions have been made for adding bays as plant operations expand.

S&C Electric Company
4433 Ravenswood Ave., Chicago 40, Illinois

Please send me your new booklet on S&C Metalclad Switchgear. No obligation on my part, of course.

Name _____ Title _____
Company _____
Address _____
City _____ Zone _____ State _____

P&S**30-AMPERE, 3-WIRE
DEVICES****for Safe, Dependable Dryer
and Heater Connections****A Complete Line . . .****Receptacles, Caps, Cord Sets****with****L-Shaped Grounding Slots and Blades
Designed for Quick, Easy Wiring**

"Lay-in" type pressure terminals on both flush and surface receptacles. No loose pieces to be handled or misplaced.

P&S 3836, surface receptacle, has $\frac{3}{4}$ " and 1" knockouts for conduit in bottom and back, and is available in brown or white (3836-W). P&S 3835 is designed for mounting on standard 4" box, with P&S 3848 Ivory-X or P&S 3849 Chrome-X plates.

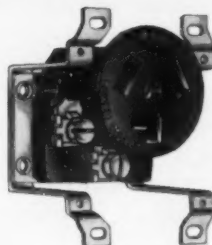
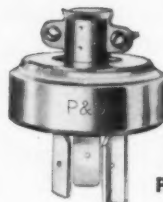
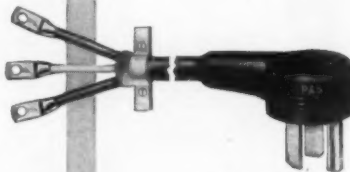
Cord grip caps are heavily armored and finished to resist corrosion. Sturdy P&S 9339 cord set is non-separable, molded rubber type with three No. 10 wires.

Cash in on the increasing demand for dryer and heater connections with these new P&S devices. Place your order on your P&S distributor today.

For complete catalog, write Dept. M



Approved by
Underwriters Laboratories

**P&S 3836****P&S 3835****P&S 9337****P&S 9331****P&S 9339****PASS & SEYMOUR, INC. • SYRACUSE 9, N. Y.**

OFFICES: 71 Murray St., New York 7, N. Y.

1229 W. Washington Blvd., Chicago 7, Ill.

"SCOTCH" 33



Now available in $\frac{3}{4}$ in. x 66 ft. "Economy Size" Rolls packed individually in easy-opening flare-edge cans, and in $\frac{3}{4}$ in. x 20 ft. "Job Size" Rolls packed 12 to a screw-top fibre container.

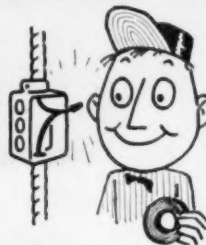


COSTS YOU LESS



One "Job Size" Roll of "Scotch" No. 33 Plastic Electrical Tape will insulate 40 splices at less than 1¢ a splice! Conventional insulating materials cost over twice as much. And "Scotch" 33

gives longer-lasting, more compact, neater results. Workmen like the way "Scotch" 33 sticks tight, stretches over contours. Plastic backing resists acids, oils, alkalis and moisture, too.



PER SPLICE!

Buy it by the carton (144 rolls)—and see for yourself why "Scotch" 33 costs you *less* per splice. Order from your supplier today!



The term "Scotch" and the plaid design are registered trademarks for the more than 300 pressure-sensitive adhesive tapes made in U.S.A. by Minnesota Mining and Mfg. Co., St. Paul 6, Minn.—also makers of "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Abrasives, "3M" Adhesives. General Export: 122 E. 42nd St., New York 17, N.Y. In Canada: London, Ont., Can.



PITTSBURGH STANDARD
the only
**GALVANIZED
THREADS**
**ON HOT-DIP
GALVANIZED CONDUIT**

say goodbye

TO THREAD RUSTING WORRIES

Here's goodbye to the rusting of threads on hot-dip galvanized conduit... goodbye to rusting in storage... goodbye to time and money-consuming thread-cleaning on the job.

Hot-dip galvanized conduit with galvanized threads is the first bonus for you from the extraordinary new Pittsburgh Standard Morrisville Plant*—the world's most modern conduit mill.

Only Pittsburgh Standard offers this major bonus to you—and at no increase in price. Here's another reason why Pittsburgh Standard Hot-Dip Galvanized Conduit is "Standard of the Trade."

**Galvanized threads on all sizes from Morrisville, and on sizes 2½-in. and larger from Etna.*

Famous "Standard of the Trade" Products

RIGID STEEL CONDUIT

All Finishes

ELECTRICAL METALLIC TUBING

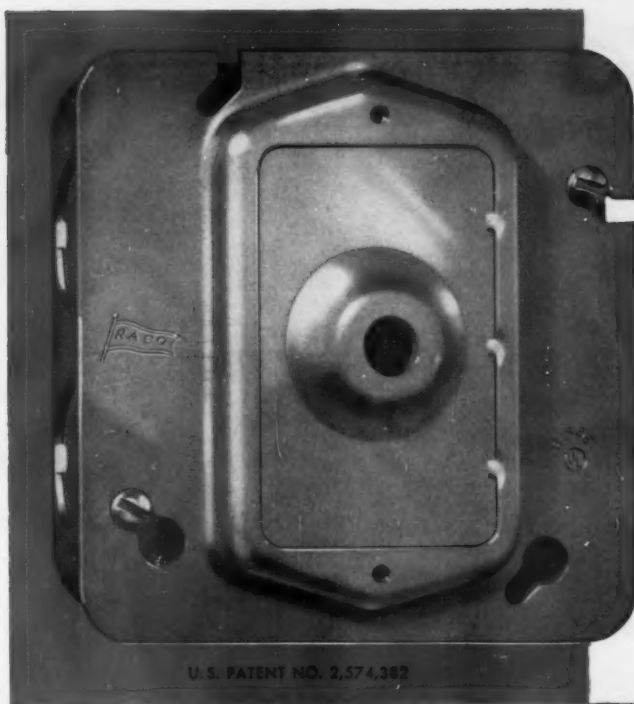
ELBOWS • COUPLINGS • FITTINGS



WHOLESALE IN PRINCIPAL CITIES

Need immediate information on which to base bidding estimates and work schedules? Ask your Pittsburgh Standard agent. The unique Pittsburgh Standard Sales Control Center will enable him to give you immediate facts. Guesswork is eliminated and you're days and dollars ahead.

61 BRIDGE ST. PITTSBURGH 23, PA. PLANTS AT MORRISVILLE & ETNA, PA.



U.S. PATENT NO. 2,574,382

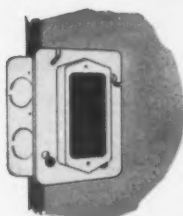
NEW RACO LOCATOR COVER

**MAKES IT EASY TO
FIND OUTLET BOXES
IN NEWLY PLASTERED
WALLS**

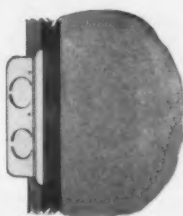
**COMPARE THE COSTS
PER OPENING!**

No. 788— $\frac{1}{2}$ " Raised • No. 789— $\frac{3}{4}$ " Raised

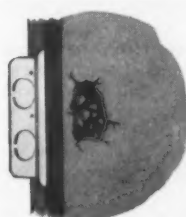
THE OLD WAY cost—dollars



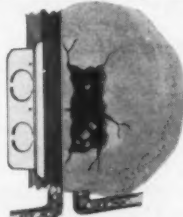
Box and device ring installed ready for the plasterers. Opening is unprotected. Location is unmarked.



Plastering completed. Some boxes may be completely covered by plaster.

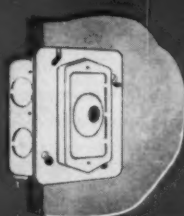


Box located by tapping or painting wall with water. Plaster fragments fill box and conduit. Plaster cracks.



Both box and conduit must be cleaned. This is time consuming and costly. Plaster requires patching.

THE NEW RACO WAY cost—pennies



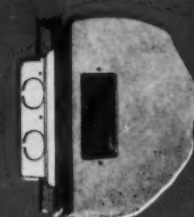
Box and device ring with RACO Locator KO are installed. Opening is protected and location is marked.



Plastering completed. Box hidden by plaster. Locator is easily found.



A screwdriver in RACO Locator KO is bent back and forth. Excess plaster breaks cleanly. Box is free of debris.



Plaster edges are clean and shored. Wiring and device installation can be done at once. No plaster problems.



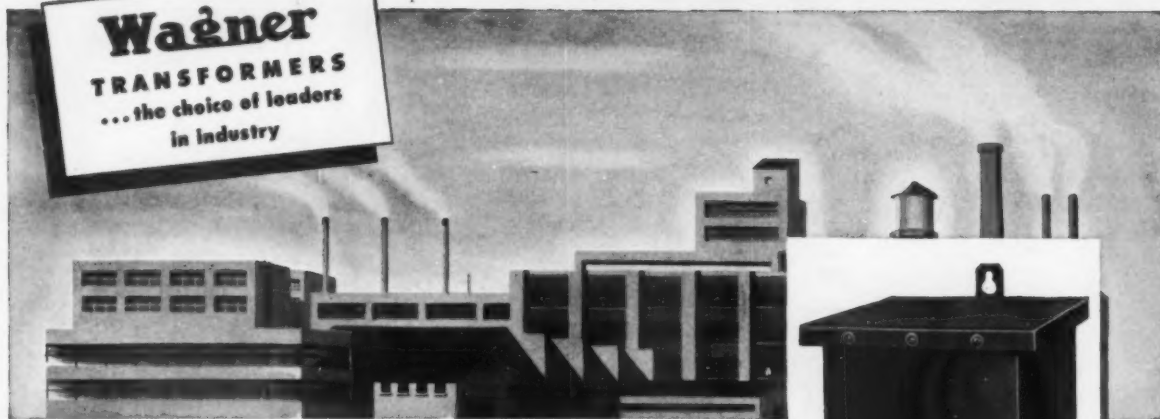
WRITE TODAY!

Get complete information on
RACO Locator Covers

ALL-STEEL EQUIPMENT INC. AURORA, ILLINOIS

You can always depend on RACO

Wagner
TRANSFORMERS
... the choice of loaders
in industry



Meet changing load demands with Wagner Dry-Type Transformers

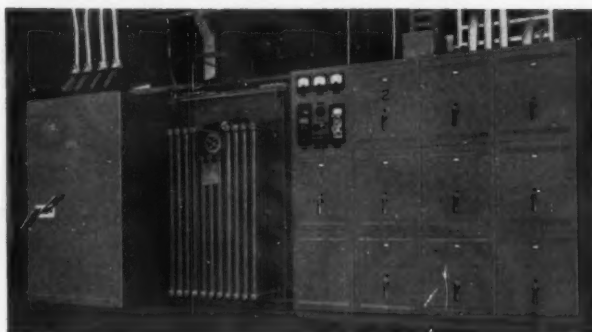
Wagner dry-type transformers can solve your problems by putting the right voltage close to the load wherever machines, portable tools or lights require voltage changes.

SAFE- Wagner dry-type transformers meet all requirements for indoor installation. They will save you money on insurance premiums. Fireproof vaults or other special protection are unnecessary—even where fire hazards are present.

ECONOMICAL- when you use Wagner dry-type transformers, you reduce installation costs—you reduce line losses—you eliminate long runs of secondary copper—and you can forget about maintenance.

COMPACT- Wagner dry-type transformers are small in size—light in weight—easy to install and easy to move whenever changes in plant facilities make it necessary.

Wagner general-purpose dry-type transformers are available in single-phase units, 600 volts and below, in sizes 1, 1½ and 2 kva—55° C Rise; and in sizes 3 to 100 kva—80° C Rise. Write for Bulletin TU-57.



Unit Substation Transformers for load-center power distribution

Wagner three-phase dry-type load-center transformers are built in ratings through 2000 kva in the 15-kv class and below. Transformer and incoming line section are housed in compact factory-matched enclosures, designed for direct connection to matching secondary switchgear to form a closely coupled unit substation that is streamlined in appearance and readily accessible. Complete enclosure of all equipment assures safety against contact with live parts.

Bulletins TU-56 and TU-13 give full information on Wagner Dry-Type and Liquid-Filled Substation Transformers. Write for your copies.



WAGNER ELECTRIC CORPORATION
6413 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

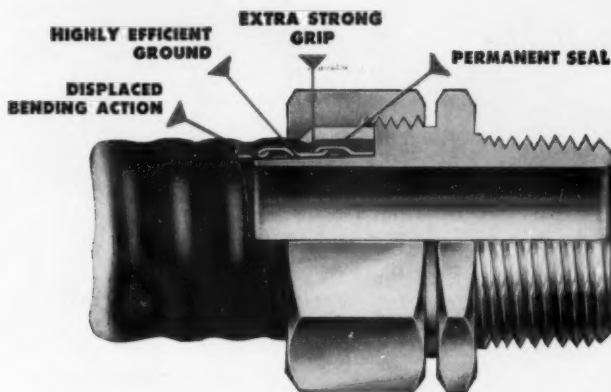
BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

ELECTRIC MOTORS
TRANSFORMERS
INDUSTRIAL BRAKES
AUTOMOTIVE
BRAKE SYSTEMS—
AIR AND HYDRAULIC

T54-1A

it's new—an improved connector for liquid-tight flexible conduit

(Sealtite or equivalent products)



PYLE-NATIONAL

"CT" series Connectors offer all these advantages

EXTRA STRONG GRIP

- Compression force is supported—not by the conduit alone—but also by the body shank, making a vise-like clamp.
- Gripping is well behind end of flexible conduit for firm anchorage against creeping loose.
- Pliable seamless sleeve makes a plastic-to-plastic grip with the conduit sheath...thereby avoids cutting and abrasion common to metal sleeves.
- High safety factor of compression range more than compensates for tolerance in the outside diameter of the flexible conduit.

HIGHLY EFFICIENT GROUND

- Less than 10 millivolt drop.
- Tapered grounding shank, integral with connector body, makes a firmly wedged contact with the flexible metal conduit.

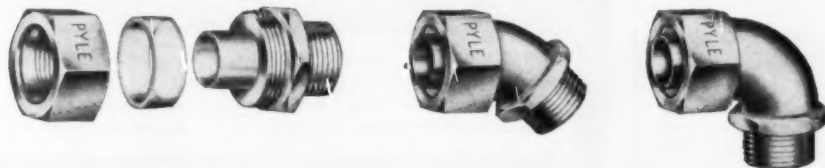
PERMANENT SEAL

- Plastic sleeve and conduit sheath have equivalent physical characteristics therefore the seal will last the life of the conduit, unimpaired by temperature variations within the limits of the conduit.

DISPLACED BENDING ACTION

- Tapered grounding shank is elongated to extend beyond gland nut, thus avoiding short radius bends which shorten the life of the conduit sheath and more important the permanency of the joint.

"CT" Series connectors can be installed assembled...no parts to lose...no wasted time. Available in straight, 45 degree and 90 degree types for $\frac{3}{8}$ " to 2" liquid-tight flexible conduit. Meet U/L and J.I.C. standards.



THE PYLE-NATIONAL COMPANY

1344 North Kostner Avenue, Chicago 51, Illinois

Branch offices and Agents in the Principal Cities of the United States • Canadian Agent: The Holden Company, Ltd., Montreal
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PLUGS AND RECEPTACLES • GYRALITES • TURBO-GENERATORS • FLOODLIGHTS • CONDUIT FITTINGS • MULTI-VENT

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . AUGUST, 1954

CFI DAY-LINE®

(COMFORT FOR INDUSTRY)

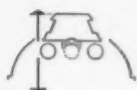
Easy to handle



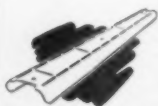
Easy to install

Contractor features include knockouts and fittings for pipe, chain, stem and messenger cable suspension; no-sag, no-bend one-piece reflector; simplified wiring.

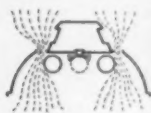
AND LOOK AT THESE USER FEATURES THAT DELIVER EXTRA VALUE AND SATISFACTION TO YOUR BUYERS!



COMFORT FOR INDUSTRY. Die-embossed apertures in reflectors provide 10% up-lighting for improved visual comfort and freedom from irritation and nervous fatigue due to eye-strain.



ALL-WHITE PORCELAIN REFLECTORS. Outside as well as inside, entire one-piece reflector is finished in snow white porcelain enamel—providing maximum high reflection surface.



COOLER, CLEANER OPERATION. A gentle flow of air passes through the apertures reducing dirt and dust deposits. This "breathing" action keeps fixture cooler, cleaner and more efficient.



TURRET® SOCKETS. Sturdy, vibration-proof Turret sockets are standard equipment on all CFI DAY-LINES—providing positive lamp seating and simple lamp installation or removal.

© G. E. Co.



THE CFI DAY-LINE ON THE JOB. Note how uplighting cuts down uncomfortable brightness contrast. CFI DAY-LINE is available in 2 and 3 lamp (75W) open-end 8 ft. Simline units; 2 and 3 lamp (40W) open- and closed-end 4 ft. RAPID-START Fluorescent units; 2 lamp (90W) open- and closed-end 5 ft. Fluorescent units with NO-BLINK starters.

Day-Brite Lighting, Inc., 5402 Bulwer Avenue,
St. Louis 7, Missouri. In Canada: Amalgamated
Electric Corp., Ltd., Toronto 6, Ontario.

"DECIDEDLY BETTER"
DAY-BRITE
Lighting Fixtures

421

NATIONALLY DISTRIBUTED EXCLUSIVELY THROUGH LEADING ELECTRICAL WHOLESALERS

now available


from  distributor's
stocks for quick
assembly on the job




T-M thermal-magnetic
trip circuit breaker





LOAD CENTERS and SERVICE EQUIPMENT

Approved by the Underwriters' Laboratories, Inc., for label service, these new  assemblies embody many features that should make them extremely popular with contractors, and builders, as well as ultimate users.

Besides providing safe, dependable, automatic circuit protection against short circuits and harmless and dangerous overloads, these new units are so designed to make the addition of new circuits, changes in capacities and replacement of damaged units a simple, easy task.

Deliveries, too, are facilitated due to the fact that the new units are of the "panel base assembly" type, which means that all components — box, front, panel-back, bus bar and main lug connection — are available in one complete package from  distributor's stocks for quick and easy assembly on the job.


An outstanding feature of the new unit is the new  T-M Thermal-Magnetic Trip Circuit Breaker with quick-make and quick-break operation on manual or automatic trip and  design magnetic blow-out.




The thermal magnetic action of the circuit breaker automatically trips the handle, indicating the circuit in trouble. Service interruptions caused by harmless, momentary overloads are eliminated, due to the time-lag action of the circuit breaker's thermal element.



On short circuits and dangerous overloads, the magnetic trip hastens the action of the circuit

breaker. Once the cause of the trouble is removed, service is restored by flipping the handle back to "off" position and then to "on".

Screwless assembly (just slip the breakers in), one pressure type of connection between circuit breaker and bus bar, and "sequence bussing" to balance the load and permit double pole, individual trip combinations are other features.

Four basic combinations to afford a maximum of 4, 8, 12 and 20 poles (all single pole or combinations of single and double pole) are available. These, plus a supply of dependable, individually-packed single and double pole individual trip  type T-M Circuit Breakers, available from distributor's shelves, meet almost any job requirement.

For contractors and builders, these new  assemblies all add up to greater convenience, faster deliveries, and quick and easy installation on the job. So include these units on all jobs requiring Load Centers and Service Equipment. For further details, see your nearest  distributor, or contact a  representative, listed in Sweet's.

 T-M Circuit Breakers are available in the following capacities: 10, 15, 20 and 30 amps., 120 volts AC single pole and/or 120/208 volts AC double pole individual trip; 40 and 50 amp., capacity furnished with  QP Quicklag P Circuit Breaker; main lugs for 100 amp., maximum, 115/230 volts, 3-wire single phase of 120/208 volts, 4-wire three phase mains. (Six circuits or less suitable for service equipment.)

*Frank Adam
Electric Co.*



BOX 357, MAIN P. O.
ST. LOUIS, MISSOURI

Makers of BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUIKHETER

COMPARE LEV-O-LOCK DEVICES FOR QUALITY

For uninterrupted power flow, LEV-O-LOCK devices are unexcelled. They incorporate every up-to-date advantage in engineering design made available by Leviton's half-century experience as leader in the wiring device field. Leviton makes sure every part is made and quality-controlled within the plant. Most rigid tests and standards have to be met. Listed by UL and CSA.

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Outperforms all others on basis of actual laboratory tests. Sturdy phenolic stands up even in roughest applications. Receptacles feature double wiping contacts, made of heavy, wear-resistant phosphor bronze. Wiring is faster, simpler — extra large binding screws make it so! It's easy to change over to LEV-O-LOCK devices. They're interchangeable with other standard locking-types.

COMPARE LEV-O-LOCK DEVICES FOR PRICE

Leviton buys huge quantities of the best in raw materials — then mass produces every component part of every product to precise Leviton standards . . . whether it's small screws or metal plates. The result? LEV-O-LOCK is a truly precise, superior product — at a trim price that defies competition!

Why pay more when the best costs less?

your best jobs are done with . . .

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Receptacle



Receptacle on Plate



Cap



Cord Connector

Available in 2, 3 and 4 wire Caps,
Connectors and receptacles in 10 and 20
AMP. ratings.

CRESCENT

TYPE UF

UNDERGROUND FEEDER and BRANCH CIRCUIT CABLE



Also listed by Underwriters' Laboratories as
TYPE NMC – NON-METALLIC SHEATHED CABLE

Type UF Underground Feeder and Branch Circuit Cable is a new type first adopted in the 1953 National Electrical Code. It is recognized in single conductor construction, sizes #14 to #4 A.W.G. inclusive and in two-conductor and three-conductor flat construction, sizes 14, 12 and 10 A.W.G. CRESCENT SYNTHOL TW thermoplastic compounds are used in insulation and jackets of these cables.

Multiple Conductor Type UF Cables are also listed as Non-Metallic Sheathed Cable, Type NMC, and may be used for both exposed and concealed work in dry, moist, damp or corrosive locations and in masonry block walls.

Licensed under Patent No. 2,663,775



Type UF single and multi-conductor cable is designed to be used underground, including direct burial, on feeders or branch circuits, when provided with overcurrent protection not in excess of the rated capacity of the individual conductors.

Send for Descriptive Bulletin

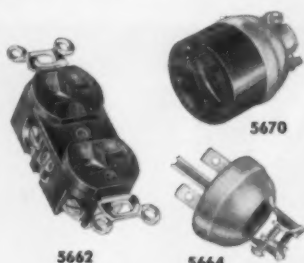


**CRESCENT
WIRE & CABLE**



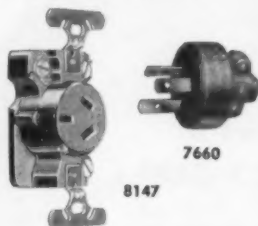
CRESCENT INSULATED WIRE & CABLE CO.

TRENTON, N. J.



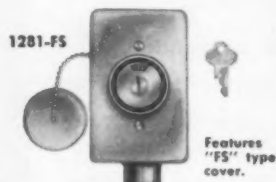
GROUNDING TYPE DEVICES, 2-3 WIRE.

Here is the newest development to provide positive identification of grounded circuits. This is the most complete line of up-to-date grounding items available anywhere.



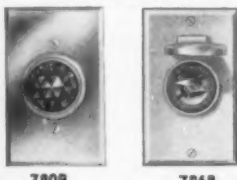
POLARIZED DEVICES, 2-3 and 4 WIRE.

Protects valuable equipment by maintaining polarity at all times. Ideal for such portable equipment as power tools, heating and lighting units and many other applications. 10 to 50 ampere capacity.



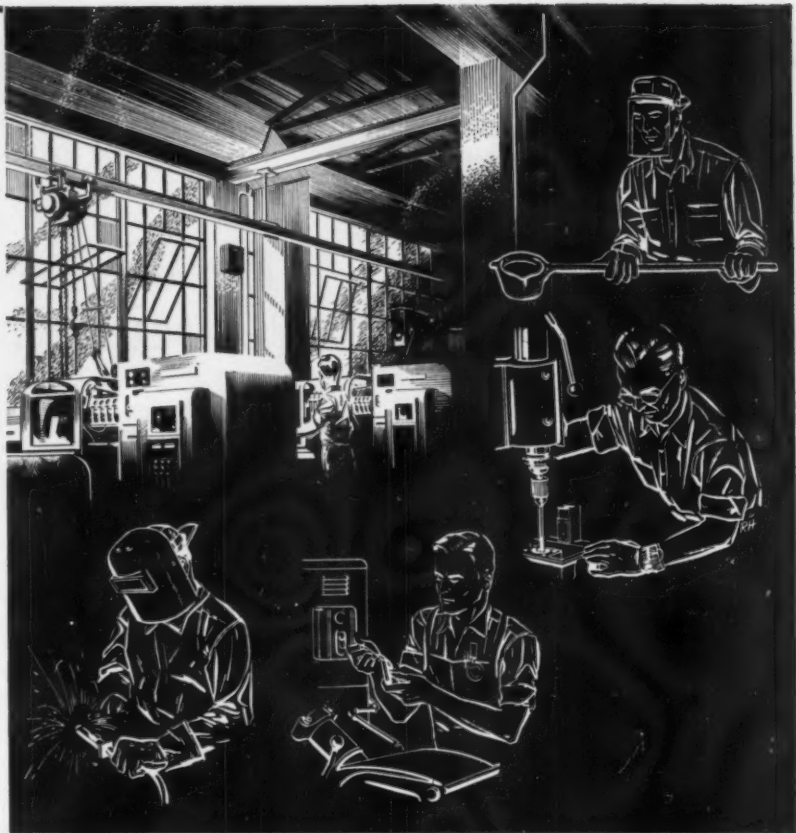
CORBIN ROTARY LOCK SWITCHES

The only switch that gives absolutely foolproof protection against unauthorized operation of vital safety lights and other circuits. Can be actuated only by turning proper key in Corbin Pin Tumbler Lock. Complete line for all locking applications.



WEATHERPROOF DEVICES.

Outdoor receptacles for every circuit requirement including single and duplex models with self-closing or screw-on cover caps. Weatherproof switches, warning lights and combinations are available.



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Modern industry depends more and more on an ever increasing variety of portable and semi-portable electrical tools and equipment. Carefully planned electrical availability is more important now than ever before. Make sure that your electrical specifications allow for today's needs and tomorrow's expansion. To help you give your client truly modern electrical convenience in his plant, look to the complete A-H line. You'll find there's an A-H wiring device for every circuit requirement. The big, fully illustrated A-H catalog can really make your electrical planning job easier — and better. Send for your copy today; just write to 103 Hawthorn Street, Hartford 6, Connecticut.



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Wiring Devices

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Offices, Sales Engineers and Warehouses in: Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Houston, Indianapolis, Kansas City, Mo., Los Angeles, Milwaukee, Minneapolis, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco. In Canada: Arrow-Hart & Hegeman (Canada) Ltd., 488 Dundas, Toronto. In England: Arrow Electric Switches, Ltd., Ealing, London W3.

Washington Report

A stabilized economy is predicted for the next six months or so by Government economists. Also, an increase in national production of goods and services to an annual rate of \$450 billion by 1959, is predicted by Presidential Adviser Gabriel Hauge. This is a 23% jump from 1953's \$365 billion annual rate.

Don't let adverse reports for July and August production, employment, retail sales, etc. confuse you. These are vacation months. Many manufacturers close down completely for one or two weeks for vacations, repairs, and other reasons. Auto makers, for example, have already started their annual slowdown for changeover to new models. Economists generally agree, however, that no new boom is brewing, neither are there signs pointing to a further overall decline in the economy.

Washington is now on vacation, officially, with the close of the 83rd Congress. But there's plenty going on just the same. Politics and fall elections will hold the limelight through November. But in the meantime the statisticians, economists, and just plain office workers down through the various Agencies are now busy summarizing the Administration's record to date, and putting together an optimistic business outlook—for 1959, 1964 and 1970—for political use this fall and for President Eisenhower's message to Congress next January.

Vacation time is being used to relight two important rooms at the White House—the Cabinet Room, and President Eisenhower's Conference Room. Floodlighting of the Archives Building is also under contract, and consideration is being given to the floodlighting of many other prominent Federal buildings in the general mid-town area. Another major long range plan for the Capital City is a street relighting program which will at first include the Mall and major mid-town streets, eventually cover the entire District of Columbia.

Self-sufficiency in production of minerals, metals and fuels for the Western Hemisphere, in case of a full-scale war, was recommended recently by the Senate's Minerals, Metals and Fuels Economic Subcommittee as a U. S. program. Included in recommendation was a step-up in Federal stockpiling of critical materials, plus a new goal of 150,000 tons annual production of titanium, and uranium fuel production adequate to meet both military and civilian requirements.

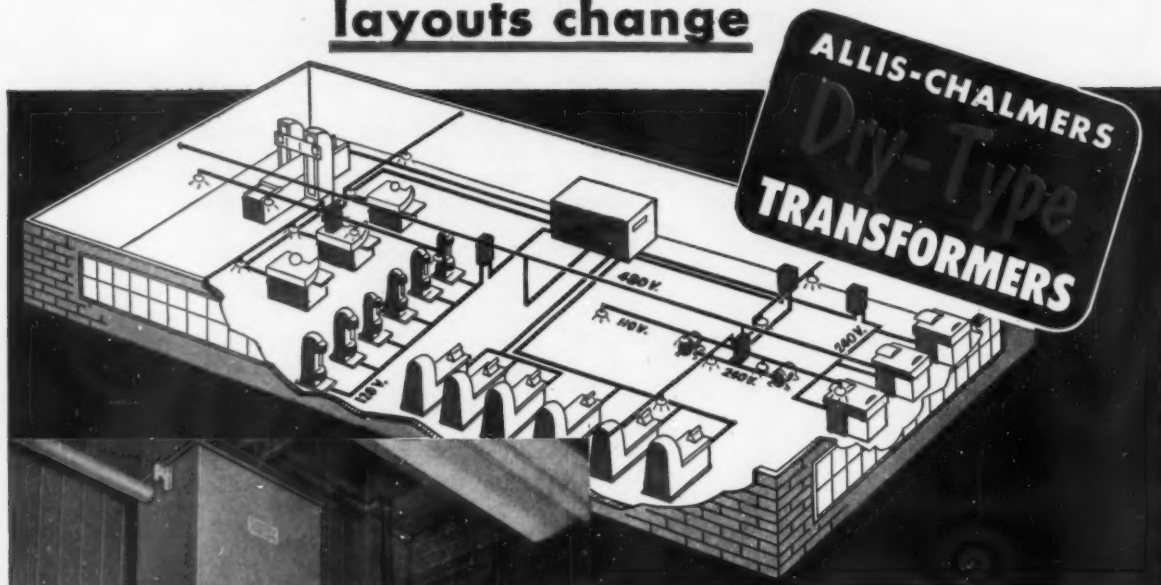
U. S. Stockpile goals on seven domestic metals, begun in 1951 and 1952, are still a long way off. Percent of goal of General Services Administration's purchases of these metals, as of June 30, 1954, was: tungsten—32.8%; manganese—21.5%; chrome—32%; mica—13.7%; beryl—17.8%; asbestos—19.7%; and columbium-tantalum—31%. Goals should be completed by 1958.

New building construction expenditures in June were \$3.3 billion, bringing the 1954 first-half total to a record \$16.6 billion. Of the June total, private spending was \$2.2 billion, and public spending \$1.1 billion, each a peak for the month of June. The June increase of 7% over May reflected seasonal gains in private housing and highway construction, Depts. of Labor and Commerce reported, with commercial building, public utility and farm construction accounting for a substantial share. Private industrial building leveled off in June, following a steady decline since January 1.

Housing starts through May totaled 452,000, with a dip of about 4,000 in May from April's 110,000 starts. With the sharp cutback in public housing over the past several months, May starts are almost entirely for privately financed homes.

Get Flexibility Like This

for lighting and machine
efficiency even when plant
layouts change



Low Installation and Operating Cost

Allis-Chalmers dry-type transformers require no expensive vaults. They are safe and clean. They've been designed to fit into modern plant layouts—they are lightweight and easy to handle. There are no gauges to check, no liquids to handle. All you need is routine inspection. Ratings are single-phase, sizes 15 kva and larger; three-phase, sizes 30 kva and larger, 15 kv and larger.

Unusual flexibility in plant power arrangements results when you use Allis-Chalmers dry-type transformers. You get better lighting and improved voltage regulation. For example, when your plant's lights are supplied by their own dry-type transformers, you can change plant layouts without interfering with the normal full power supply you need for good lighting.

In addition, dry-type transformers give you power for machines where you need it—when you need it. They increase machine efficiency by eliminating line drop from long copper runs. They simplify plant layout changes. For a new machine you just add a dry-type transformer where required. You don't need to interrupt power to all stations by tapping into a common bus.

Your local Allis-Chalmers office or distributor will help you plan the most effective power installation for your plant. Or write Allis-Chalmers, Milwaukee 1, Wisconsin for Bulletin 61B6382A.

A-4390



ALLIS-CHALMERS

AUGUST at a Glance

ROAD PROGRAM—The spectacular 50 billion dollar modern roads program proposed by President Eisenhower to the Governors' conference is big news for the electrical industry. The construction of limited-access highways, like the Pennsylvania and New Jersey Turnpikes and the New York Thruway involve, in addition to grading, earth-moving and roadway construction, many new buildings and facilities, all dependent upon electrical work. For instance, a recent electrical contract for one of the service stops on the New York Thruway was let for approximately \$90,000. Large appropriations go for the lighting of interchanges and toll stations. Big motel and shopping center installations spring up on intersecting and feeder roads.

Excellent on-the-road facilities also impel the modernization and building up of communities in contact with the new traffic stream. Fast transportation opens up undeveloped areas to suburban home building and encourages the dispersal of strategically important industrial plants.

The full impact would be difficult to appraise, but the President's program, if adopted, will certainly create very large and widely distributed markets for the goods and services of the electrical industry for many years to come.

PROMOTION—An interesting variation in promotion devices is being used by the MacNutt Electric Co.,

New York City electrical contractors. In anticipation of the vacation season they sent their customers an excellent and useful Road Atlas with the company name prominently inscribed on the cover. The cordial little note of transmittal attached closed with one of those hard-to-forget phrases, "Drive safely—we would like to keep you on our mailing list for a long time".

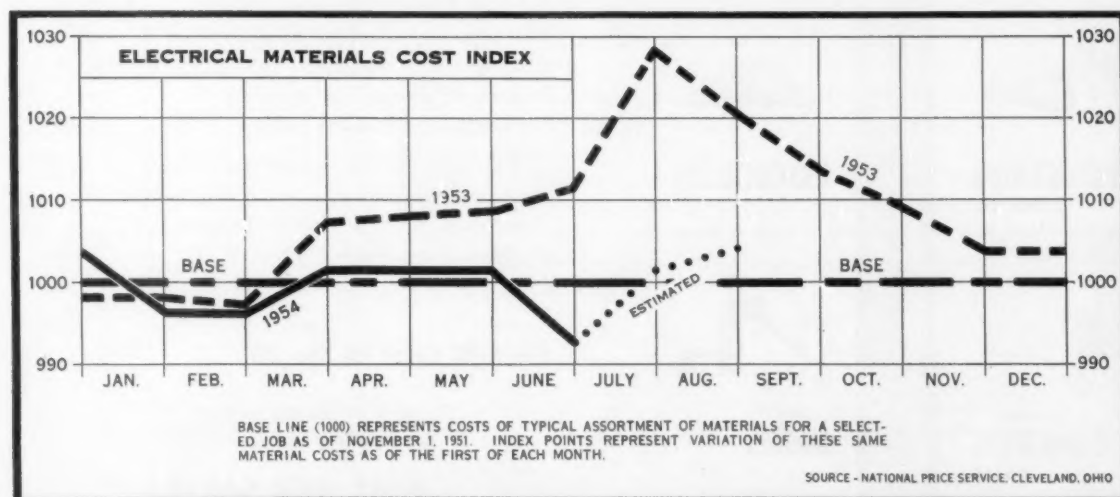
LIGHTING COMPETITION—The free interchange of ideas has helped make America the industrial leader among nations that it is. The *Electrical Construction and Maintenance* 1954 Lighting Competition for Electrical Contractors helps to keep this interchange of ideas active. It affords contractors and their employees an opportunity to pass along new and unusual lighting application techniques used on their recent lighting jobs, plus a chance at cash prizes, awards, and national recognition for jobs well done. The contest closes December 1. Lighting installations sold and installed since August 1, 1953 are eligible for entry.

FIRST 100-AMP ORDINANCE?—The borough council of Dumont, New Jersey (16,000 pop.) believes that electricity is here to stay. It believes also that the citizens of a prosperous community of suburban homes should be able to use modern electrical appliances in reasonable abundance without danger to life and property. On

July 21 the council approved for public hearing an ordinance amending the building code to require not less than No. 2 residential service entrance conductors, and panelboard capacity of not less than one 50-amp, 3-wire, 240/120-volt branch circuit, not less than one 25-amp, 3-wire, 240/120-volt branch circuit, not less than two 20-amp, 2-wire, 120-volt appliance circuits and not less than ten 15-amp, 2-wire, 120-volt circuits.

The service conductor provision is conventional and conforms substantially with the requirements set forth in the new Handbook of Residential Wiring Design and the voluntary standards proposed by the National Association of Home Builders. It also meets "functional" design considerations for residential general-purpose and electric cooking loads, (*Electrical Construction and Maintenance*, March 1954). The number of general-purpose and individual-use circuits are intended to encourage the connection of heavy duty automatic appliances (like washers, dish washers, ironers and room coolers) to individual circuits thus reducing the probability and hazards of overloading inherent in connecting such equipments to appliance and general-purpose circuits.

While other communities already have the benefits of 100-amp minimum residential services by prevailing practice or utility rule, the Dumont action is believed to be the first to include such requirements in a municipal building code.



ANACONDA DURALL-T

is fully approved* as
underground feeder (Type UF)

*by Underwriters' Laboratories, Inc.



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WALLS**



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**Reg. U. S. Pat. Off. †Trade Mark 54443

the right cable for the job

ANACONDA®

WIRE AND CABLE

New Factors for Heat

Electric space heat is plainly on its way. Growth is well established where mild climate and low electric rates combine to make it especially attractive. But significant applications are showing up in other areas in sufficient numbers to indicate that the market opportunities are by no means wholly dependent upon climate or rates.

American people will not tolerate a "luxury". If it pleases them, they will rationalize it into a necessity as soon as they can see where premium cost represents premium value.

For many modern appliances and electrical conveniences, energy cost is no longer a factor in public acceptance. But for electric space heating, energy cost is the only remaining adverse factor and will provide the only limits to acceptance and to application for the years ahead. At the moment this limitation is fortunate. The electrical industry would find a runaway growth of heating load very difficult to serve.

The tide can not be held for long. Early installations of electric heat were applied to poorly insulated structures designed to be heated with fuel burning equipment. Experience has fed back into building planning. Great strides are now being made in designing specifically for electric heat. Unsuspected economies have been uncovered. And as the energy cost premium is narrowed, parallel developments in application and control are enhancing the premium value.

Most industry discussion of electric heating centers around the opportunity in the residential market where bold planning and innovations in plush comfort are readily salable. How about apartments, offices, stores, schools, or industrial buildings? When all the facts are in—useful space, ownership cost, custodial cost, system maintenance, control, economies in building design and upkeep, energy cost—for many buildings the case for electric heat can stand up to a plain dollars and cents comparison today.

The wide acceptance of summer air conditioning, the heat pump, and the growing number of new resistance heating equipments available have changed much of our traditional criteria for heat application. Types of projects for which, only a few years ago, electric heating may have appeared impractical deserve to be restudied in the light of these new factors.

Wm. T. Stuart



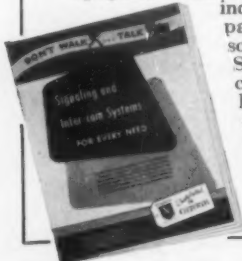
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In addition, Graybar distributes *everything electrical* for wiring, lighting, power, and ventilation—over 100,000 items in all. *Graybar Electric Co., Inc. Executive Offices: Graybar Building, New York 17, N. Y.*

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- *Fire protection with sprinkler system*
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- *Intercommunication system.*

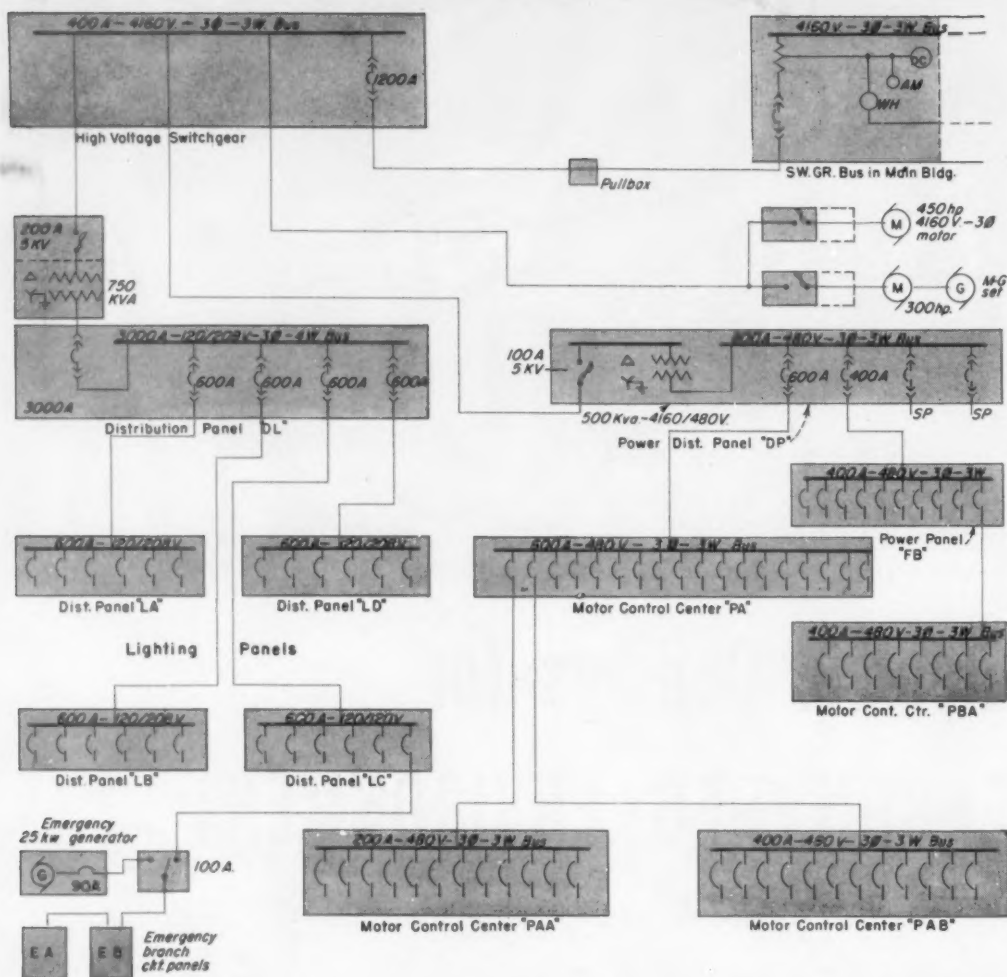
Communication service by telephone

- *Support and concealment of mechanical equipment*
- *Room enclosure*

By **Berlon C. Cooper**

EL SEGUNDO Division of Douglas Aircraft Co., Inc., normally pioneers in the design of advanced combat aircraft, have recently pioneered in still another field. They have just completed a new aircraft design center which features new multifunction electric ceilings that are without precedent. These ceilings not only form an enclosure to finish off the upper part of all room areas, but also incorporate mechanical and electrical services for the production and control of sight, sound, safety and miscellaneous services. Integrated into each ceiling unit are seven basic services, all of which were included in the electrical specifications and installed by the electrical contractor. This installation thus marks an advanced step in the field of electrical design and utilization application.

This new building is a two-story \$2 million structure located in El Segundo, California, alongside the main office building of the 22-year old El Segundo Division. Considered the world's newest and most advanced aircraft engineering center, it was dedicated on July 3, 1954. It will house the crack 1500-man engineering team headed by Chief Engineer Edward H. Heinemann, and provide more efficient



POWER DISTRIBUTION for electric light and power in new Douglas Engineering Office building. Main high voltage switchgear is fed from 4160-v 3-phase supply in substation of adjoining main plant through 3-350MCM 5 kv cables.

working space and facilities for the creative efforts of this highly experienced engineering department, and for the design of tomorrow's supersonic combat jets.

The building is of steel and concrete, and measures 210 by 330 feet. Centered on each floor are large open areas, each 210 feet square, housing engineering and drafting areas. Across each end of the building, both front and back, are private offices, conference rooms, computer rooms, toilets and mechanical equipment areas. The two large 44,100 sq ft areas and 13 private offices of varying sizes are equipped with the special electric ceilings, while other areas are conventionally lighted, air conditioned, and acoustically treated.

In addition, the roof of this new structure features a rooftop heliport which will operate to transport Douglas engineers from this design center to surrounding test areas and other plants of the Douglas organization.

Electrical Distribution

Power for the new building is supplied from a large 1200-amp circuit breaker connected to the switchgear bus of the nearest substation within the nearby main plant. Three 350MCM 5-kv cables run from this substation breaker to the main high voltage switchgear in the new building and are connected to the main 4160-v, 3-phase, 3-wire 400-amp bus through a 1200-amp manual trip circuit breaker. This bus in turn supplies energy for motor, power and lighting loads over three feeder circuits.

First feeder supplies power to a 750-kva transformer over three No. 2/0, 5-kv cables, where 4160-volt service is converted to 120/208-v, 3-phase, 4-wire service on a 3000-amp bus with solid neutral. This bus in turn supplies energy to four lighting distribution panels, through a 600-amp circuit breaker for each panel feeder. Each of these feeders consists of 8-350MCM cables. A 25-kw emergency generator

of the automatic start type, supplying energy at 120/208-volts, 3-phase, 4-wire is connected to two emergency branch panels through a 100-amp automatic transfer switch tied-in to work on a feeder from one of the distribution panels.

Second feeder from high voltage switchgear feeds a 500-kva transformer over three No. 1 cables, where 4160-volt service is converted to 480-volt, 3-phase, 3-wire service and distributed from an 800-amp bus. A 600-amp breaker supplies power to one motor control center 600-amp bus, which in turn feeds miscellaneous pump and fan motors and two other motor control centers, one with 200-amp bus and the other with 400-amp bus.

The third feeder from the main switchgear supplies 4160-volt power to a 450-hp 3-phase synchronous motor operating the refrigerator compressor, and to a 300-hp 3-phase motor-generator set.

Basically, the new electric ceiling is

a wall-to-wall translucent ceiling lighting system, in which are integrated acoustic baffles for noise control, air diffusers for climatic control, sprinkler heads for fire protection, PA speakers for intercommunication, power outlets in wireway section of electrical baffles, and provisions for carrying telephone cables in ceiling structure to point of use.

Lighting System

The lighting system consists of corrugated plastic diffusing panels supported on a structural framework, above which are installed lighting channel housings and assemblies which support and operate 96-inch 3500°K standard white slimline fluorescent lamps on 36-inch centers. In the entire installation there are 3844 eight-foot lamps, 89 six-foot lamps, and 46 four-foot lamps. The two engineering rooms have the world's largest open area translucent ceiling, covering an area equal to two acres with plastic panels and using over five miles of fluorescent tubing.

A major problem in installing these electric ceilings was that of coordinating all construction and installation work so that no one service system in the ceiling would interfere with any other service system. For example, fire protection pipes had to be located and installed in such a manner that they would not interfere with air ducts, or lighting channels, accessories, and lamps. The fact that the architects and engineers placed the furnishing and installation of this entire ceiling under one subcontractor's responsibility, the electrical contractor, made it possible for the job to be done with a minimum of interference. The installation had many ramifications, and work had to be done to very exacting tolerances. This meant complete coordination of all the specialty trades on the job, each working in harmony and cooperation with all the others.

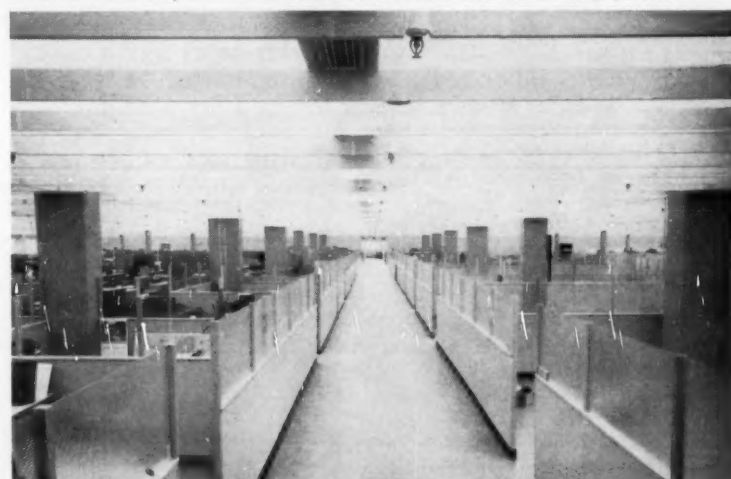
In building the structure, the general contractor used steel pans for the cement slab construction. Since the specifications called for preset inserts in the concrete slabs for supporting the lighting channel assemblies (hence the electric ceilings), the electrical contractor got permission from the general contractor to drill the steel pans for the inserts. A $\frac{1}{2}$ -in. by $1\frac{1}{2}$ -in. elevator bolt was placed in holes drilled in steel pan forms, with a nut on top and one on bottom of each bolt. Then when the concrete was poured and set, the nut on the bottom of the form was removed so the form could be taken down. This left $\frac{1}{2}$ -in. of the bolt exposed to which



TRANSFORMER ROOM houses 500-kva 4160/480-v 3-phase 3-wire (left) and 750-kva 4160/120/208-v 3-phase 4-wire (right) transformers, plus main high voltage switchgear and main distribution panels for power and lighting.



ELECTRONIC COMPUTERS rest on a raised hardwood floor, are served by four 750MCM 600-v cables through 5-in. conduit. Lighting is by suspended type continuous row 2-lamp slimline louvered fluorescents on 8-ft. centers.



VIEW down center aisle of seven-bay wide second floor shows completed installation of multiple purpose ceiling. Note how baffles shield light diffusers in normal line of vision. Intensity is over 100 footcandles and light is uniformly diffused.

a bracket was attached for fastening of a support rod for supporting the lighting channel and assembly. The ceiling supplier furnished drawings showing the exact spacing of these inserts, which the electrical contractor followed in locating the inserts in the ceiling slab. This technique saved many man-hours of work for the electrical contractor.

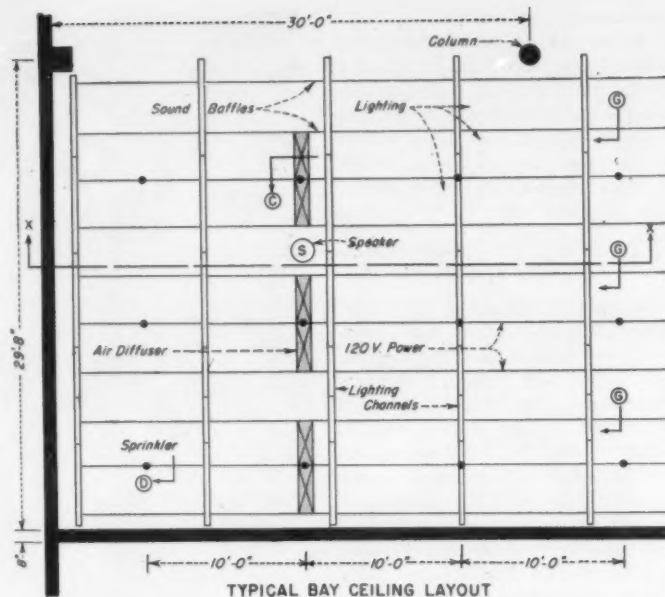
The plastic diffusers were to be installed 10 feet from the floor. In order to strike a proper level throughout the large open area, bench marks were made on every column and at points along the walls to serve as a constant check when installing the lighting channels and acoustical baffles to a level plane. A field transit level was used to obtain the proper elevation, using the various bench marks as a guide.

The lighting channels were first installed (Detail A) by attaching a support rod to the ceiling slab insert bracket, then lifting the channel into place and attaching to support rod assembly. Channel sections and spacers were assembled on the floor before raising into position, in channel length sections. Channels were then fastened together after being raised into position.

In installing acoustic baffles, which also serve as framework for plastic lighting diffuser panels, it was necessary to first establish a basic center line through one of the furred columns adjoining the center bays. This was necessary because the columns were not located on dead center. From this basic center line baffles were installed in both directions, so that a tolerance not in excess of $\frac{1}{4}$ -inch across the 210-foot room width could be met. This was further complicated by having factory prefabricated holes in baffle rails for sprinkler heads on 10-foot centers, for nut-and-bolt fastening of cross baffles at every column, and for telephone cable holes in baffles at every baffle run and at every furred column. Use of this basic center line as the beginning point for baffle installation also saved many man-hours of work.

The ceiling height was maintained at a 10-foot level by using a straight edge and spirit level for each new baffle pulled up into place.

Plastic diffusing panels were shipped to the job in standard 25-in. by 36-in. size. Hundreds of these had to be notched for sprinkler heads, dozens had to have circular cuts to fit around "round" columns, many had to be cut to fit around intercom speakers, and many to fit air diffusers. To do this job, electrical job superintendent Charles E. Ernst used a Tyler indus-

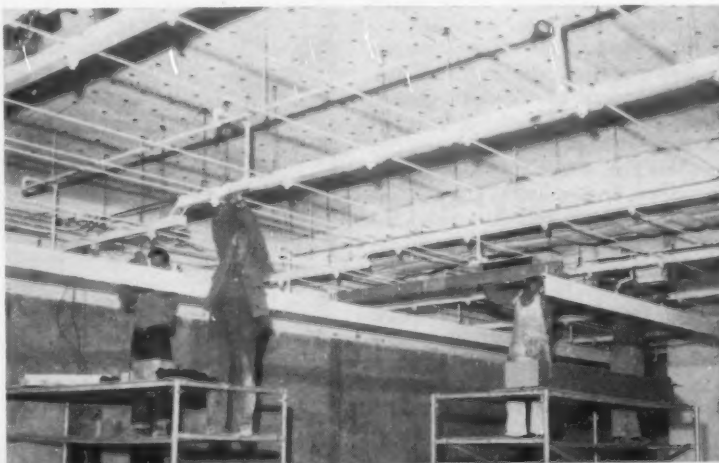


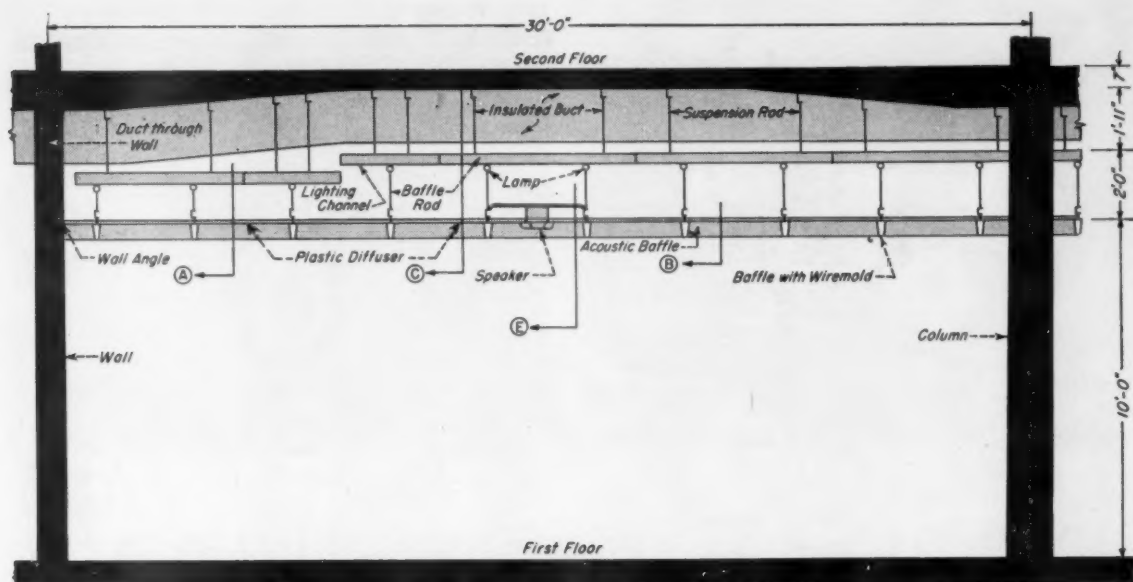
CEILING LAYOUT for typical 30-ft. square bay shows variety of service functions packed into ceiling to provide best possible working environment.



PRIVATE OFFICE of Chief Engineer Edw. H. Heinemann after lighting installation was completed. No baffles were used in private offices. Plexiglas diffusers rest on fusion strip of acrylic plastic. Note sprinkler heads and air diffusers.

STRAIGHT EDGE and spirit level were used to install acoustic baffles on level plane. Ceiling slab on second floor is covered with thermal insulation which aids in keeping down noise from helicopters landing on roof above.





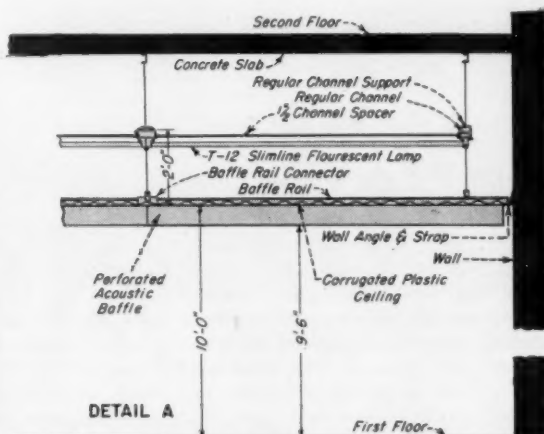
SECTION X-X THROUGH TYPICAL BAY

ALL-PURPOSE ceiling conceals a maze of air ducts, fire protection pipes, conduits, lighting channels and supports in plenum cavity, also incorporates features for improved sight, sound, safety and service.



PRESET INSERTS were used in concrete ceiling slab, to which bracket was attached for support rod holding lighting channel assembly. Conduits carry branch circuits.

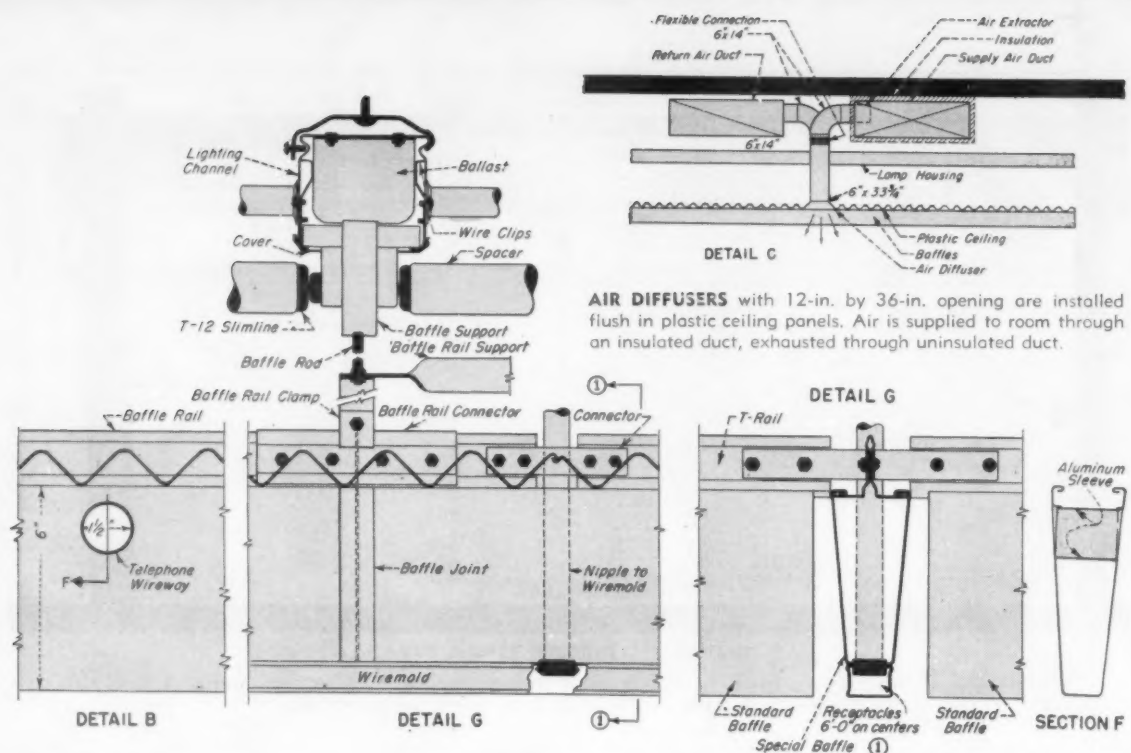
LIGHTING CHANNEL assemblies including spacer conduits were installed below air ducts and fire protection pipes, and supported from ceiling slab inserts or air duct brackets.



LIGHTING SYSTEM consists of Plexiglas panels resting on baffle rail, plus fluorescent lamps on 36-in. centers held in channel framework which houses ballasts (see Detail G).

SLOPING CEILING slab made necessary lower level for lighting channel sections near walls. Note channel bracings at wall and between sections.





BAFFLES on 3-ft centers are used to control sound, and to support plastic diffusing panels. These are wedge-shaped, 6 inches deep. Standard baffle was altered (Section F) to provide telephone cable wireway, also to provide convenience outlets in Wiremold in electrical baffle (Detail G).

trial bandsaw which he had shipped to the job for this purpose. He first measured the required pieces of plastic to be cut for each baffle run between air diffusers, and marked a lighting layout print with symbols so the electricians could identify each plastic panel cut for a particular section. These special panels were pre-cut, marked, and laid in piles in the area between each column. The workmen then picked up panels according to symbol markings and laid into the space for which it was marked. Circular cuts were made accurately by using a corrugated wood jig made to fit the corrugated plastic panels. Standard uncut panels were loaded onto movable scaffolding and installed in place direct from shipping cartons.

When plastic diffuser panels were in place, they were sprayed with a Merix 79 solution by a painter using a spray gun to save time. This solution is used to destaticize the plastic, and the painter was used because electricians are not permitted to use a spray gun. By spraying, an area of about 3500 sq ft per gallon was obtained, as compared with an area of about 2000 sq ft per gallon which results from applying by the rub-on method. Also, much less time was required per panel for spraying than for rubbing on.

The entire electric ceiling was pre-

fabricated at the factory by the F. W. Wakefield Brass Company, Vermilion, Ohio. It was shipped with all parts and pieces fully marked and identified. These parts went together on the job with comparative ease and simplicity, but it was necessary to carefully identify each part by its markings, and to use each piece in the place for which it was intended. Markings conformed to layout drawings from which the entire assemblies were made.

Baffles were not used in private offices and the conference room. Fusion strips were used instead, which hold the plastic panels, and also transmit light through their diffused plastic framework.

Initial lighting intensities averaged over 100 footcandles in private offices, and about 135 footcandles average over the entire central area of each of the large engineering and drafting rooms. The intensity dropped to about 110 footcandles near the walls in these same rooms. Since the building is air conditioned, it is expected that in-service maintained lighting levels will be at least 75% of the initial footcandle values.

The lighting is exceptionally comfortable. The maximum brightness of the diffusers is 150 footlamberts, with the F-96T12 slimline standard white lamps spaced 36 inches on centers and

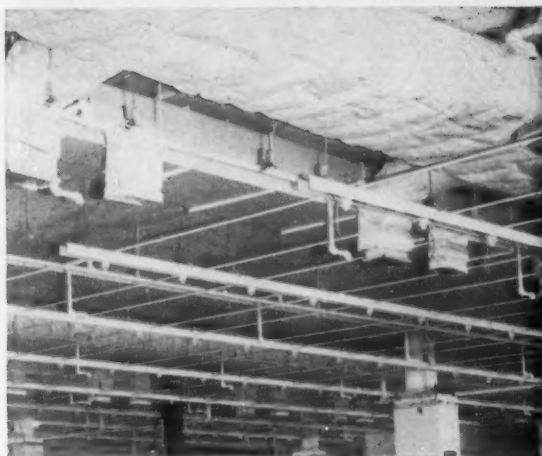
located 24 inches above the plastic ceiling line. The six-inch-deep acoustical baffles, also spaced 36 inches on centers, provide shielding for the corrugated plastic diffusing panels. In the large areas, when employees look across the room normal to baffles, the diffusing light panels in their normal line of vision are completely shielded from view so that only the softly lighted sides of the baffles are visible. Maximum brightness of these baffle sides is between 50 and 60 footlamberts.

Bright blocks of color and excellent selection of color masses on walls, columns, and elsewhere make the entire area artistically harmonious as well as efficient for work. The color treatment of the walls consisted of a white undercoat with speckled green and pink overlay which causes changes of color from different positions in the rooms. Combined with the soft, restful, shadowless light of high intensity produced by the low brightness, broad-area translucent ceiling, these wall colors and finishes and the lighting provide a very pleasant and comfortable visual environment.

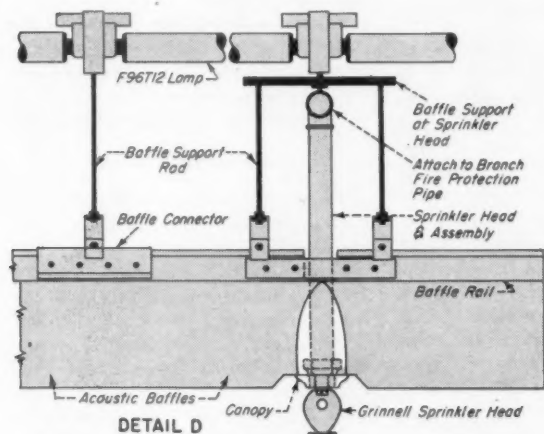
Maximum use is also made of daylight. Windows are glazed with tinted glass. The south windows are equipped with vertically louvered aluminum shields outside, which are solar con-



BAFFLES are run in one direction only on 3-ft centers, and at right angles only at column centers. Note neat fit of baffles and Plexiglas at top of column.



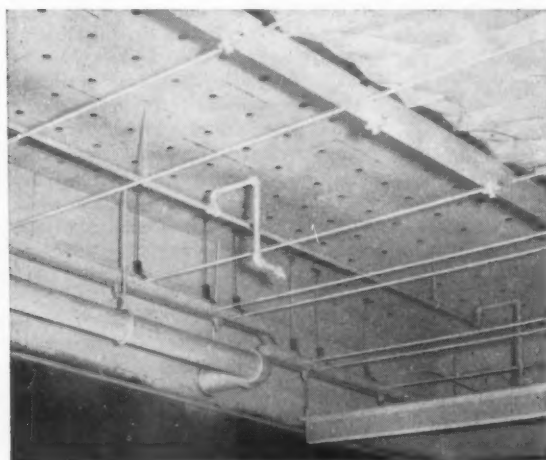
AIR DUCTS are attached directly to ceiling, so that lighting channel assemblies being directly below, generally suspended from support inserts in ceiling slab.



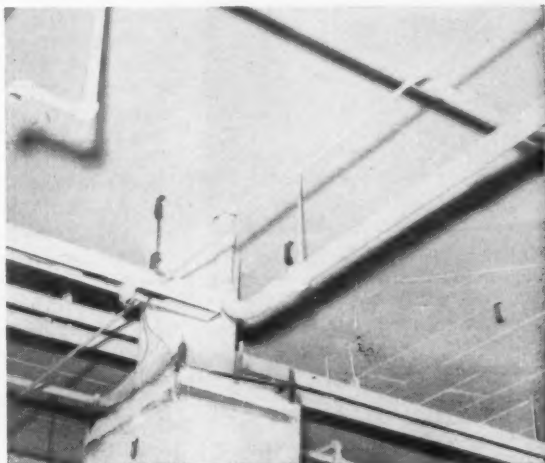
SPRINKLER head is set in bottom of sound baffle, with assembly extending up to offset section and branch pipe line. Cone section above sprinkler head is also perforated.



AIR DIFFUSERS in conference room are set flush with ceiling between fusion strips holding plastic ceiling panels. Baffles were not used in this room.



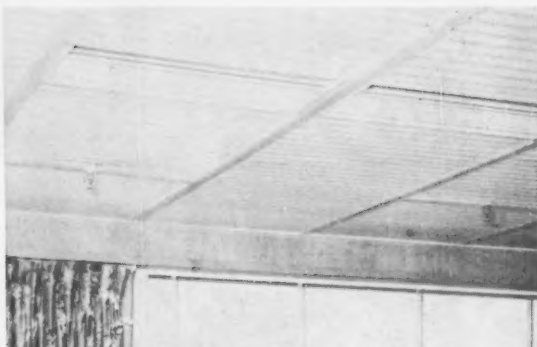
LARGE PIPE on wall (left) is 6-in. fire protection line feeding entire sprinkler system. Note how lighting channel had to be installed directly above this pipe.



FEED PIPE for fire protection system blocks lighting channel run at column where pipe elbows to extend up column vertically.



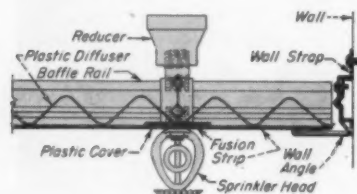
BRANCH line fire protection pipe taps off main feeder line (lower left), supplies offsets which will be connected to sprinkler head assemblies as shown in Detail D.



SPRINKLER HEADS are installed in plastic fusion strip in all private offices where acoustic baffles were omitted. Sprinklers are installed on 10-foot centers throughout building.



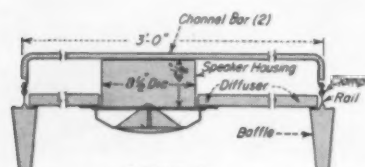
CLOSE-UP view of sprinkler head built into perforated sound baffle.



ASSEMBLY of sprinkler head is simplified when installed in fusion strip.



SPEAKER is installed in housing after ceiling installation has been completed.



DETAIL E
SPEAKER and housing for intercom system is installed flush in plastic panels.

trolled to rotate with the sun and provide maximum daylight without glare from outside.

Sound Control

Acoustic baffles of perforated metal, packed with an acoustical material inside, are used in the large engineering and drafting areas to control noise. These baffles, six inches deep, are supported from the lighting channel assemblies and spaced on 36-inch centers in one direction, 30-foot centers (at column lines) in the other direction.

There are three types of acoustical baffles—the standard type (Detail B), a similar baffle equipped with $1\frac{1}{2}$ -inch diameter holes for telephone cable (Section F, Detail B), and a special baffle having an electrical raceway bottom channel (Detail G). The total footage of baffles is nearly 30,000 feet, or more than five miles.

Climatic Control

An air distribution system provides climatic control throughout the building. It consists of rectangular outlets 14 inches by 36 inches spaced on 12-foot by 30-foot centers in groups of two outlets end-to-end at each location. Thus there are about 600 air diffusers in the entire building. These diffusers can provide cool air or warm air, and they handle the return air. The system is of 450-ton capacity, and changes the air completely 12 times hourly. The air returns are considered important particularly because of the large number of electrical machines in the engineering department, and the use of analog computers which generate heat excessively. Details of the climatic control system are shown in Detail C.

Fire Protection

A complete fire protection system is installed, including main pipe 6

inches in diameter, feeder and branch pipes, and 1024 Grinnell sprinkler heads located on 9-ft by 10-ft centers throughout the building.

Sprinkler heads are built into the acoustic baffles, or into the fusion strips in private offices. Detail D shows special supports required for baffles at locations where sprinkler heads occur.

Communication Service

Intercom broadcast and telephone cables are both carried in the electric ceiling.

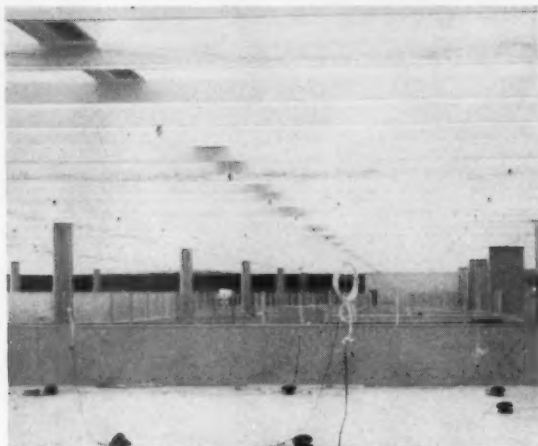
The intercom system has a total of 100 loudspeakers recessed into the luminous ceiling on 30-foot by 30-foot centers. Details of housing and mounting are shown in Detail E.

Telephone wires are run along the sides of the baffles in ivory cable. When necessary to run cables perpendicular to the main baffle runs, holes are provided (Section F, Detail B) at the top of the baffle. Cables are distributed to the office areas from three main columns in the center area of the engineering room where the distribution panels are located.

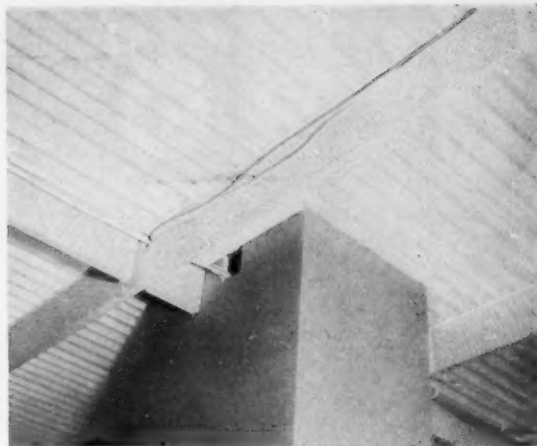
The telephone lines drop vertically from the overhead baffles to the desks below. It might be assumed that this would create a distracting appearance. However, since the lines are in ivory cable, they blend in with the white luminous ceiling background quite well and, while visible, they are not objectionable.

Power Service

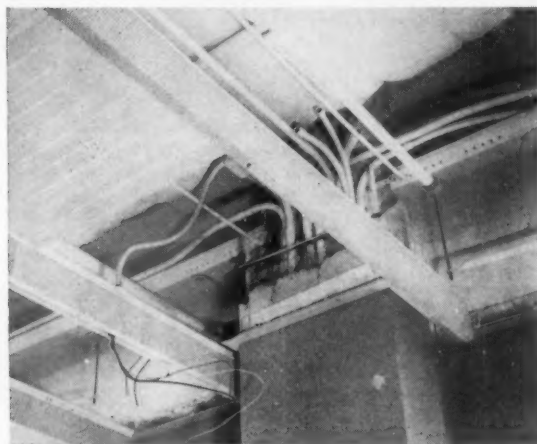
Electric power at 120-volt service is provided throughout all areas under the translucent ceiling from convenience receptacles in electrical baffles. These baffles are located on 9-foot centers, and carry convenience receptacles along the bottom of each baffle on 6-foot centers. Details of the construction are shown in Detail G.



TELEPHONE cables are dropped from overhead acoustic baffles at point of use. Ivory finish makes them practically invisible. Note absence of light reflections in clear glass panels on top of office partitions.



OPENING at top of furred column is for ivory telephone cables which are fed through holes in baffles (Section F, Detail B) and run along baffles to point of use, supported by metal clips.



POWER is supplied to electrical baffles, installed on 9-ft centers, through flexible cable between baffle and branch circuit outlet box at top of furred column.



CONVENIENCE OUTLETS in metal raceway at bottom of electrical baffles (Detail G) are wired by electricians after baffles are installed on ceiling.

This baffle was specially constructed so that its overall size would conform to the standard baffle size, yet carry a metal raceway at the bottom. This electrical circuit is fed from the furred column branch circuit panels by means of conduit up to an outlet box in the ceiling plenum, thence by flexible cable to the baffle nipple fitting.

Objectives Achieved

Edward H. Heinemann, chief of Douglas' El Segundo Division engineering for the past 18 years, set the functional objectives for the new Engineering Office building. Recently selected as Aviation Man of the Year for his design achievements, he gave climate, lighting, space and acoustics as key factors in employee efficiency and turnover—when these factors are

poor, working environment is unfavorable; when good, employee morale is high, efficiency is up, turnover drops or disappears. Because of the heavy investment in training of highly skilled technicians, and, eventually, their valuable experience, Heinemann asked for facilities which would provide an optimum working environment.

The electric ceiling is an obvious answer. The idea of incorporating the nine functions already outlined into one building element—the ceiling—is a practical answer, a logical approach to the functional use of the ceiling to provide the optimum working environment.

Responsible for the pioneer electric ceiling design in this modern office building was Robert C. Sunderland, electrical engineer of Kistner, Wright

and Wright, Los Angeles, architects and engineers for the project who designed the building under the direction of Richard Skelton, plant engineer for El Segundo Division of Douglas Aircraft Company. General contractors were Davies, Keusder & Brown. Hoffman & Jacobs, Inc., of Long Beach, Calif., were the electrical contractors. The translucent ceiling, including baffles and all related elements of the electric ceiling, was manufactured and supplied by The F. W. Wakefield Brass Company, Vermilion, Ohio. Wakefield's Los Angeles representative, William A. McGuire, sold this job and helped supervise the installation of the ceiling in close cooperation with the electrical contractor's general construction foreman and job superintendent.



TRENCH DIGGING was done with power shovel which followed up team of jack-hammer operators who broke concrete surface of sidewalk near curb.



TWO MEN handled laying of cable on sand bed in trench; walked along edge of trench and unrolled cable coil which is stiffened by copper sheath but is completely flexible.

MI Cable For Signal Circuits

Installation details on mineral insulated, metal sheathed (Type MI) cable used for underground signal circuits in Bayonne, N. J.

MINERAL insulated, metal sheathed cable is today the strong and reliable nerve system of police and fire alarms in Bayonne, N. J. Here, a single neoprene-jacketed cable of the MI classification, in a direct-burial installation, connects police and fire headquarters with street-corner call-boxes along a busy city street. Accompanying illustrations point up simple installation details used on this new completely protected type of wiring which is discussed, for the first time, in Article 330 of the 1953 National Electrical Code. The cable used on this job, made by General Cable Corp., consists of seven No. 14 conductors spaced and insulated by a non-combustible mineral insulation within a flexible seamless copper sheath which is neoprene jacketed.

The city is installing the new underground system as part of a program for burying all electrical services and facilities. First, electric utility lines were changed from pole line to underground; now the city alarm circuits have been removed from the poles.

Actual installation of the signal circuits followed a straightforward pattern. Along the curb edge of the sidewalk, the width of the required trench was marked with chalk. A team of jack-hammer operators broke the surface of the concrete within the chalk lines, and a power shovel followed up to dig the running trench to a depth of about 24 inches. The trench was then hand-shoveled clean, and a 6-inch bed of clean sand was packed in the trench to provide a soft cushion for the cable, preventing damage or abra-

sion to the neoprene jacket and copper sheath. Two men then simply rolled the reel of cable in the trench, laying the cable run on top of the sand bed. Another 6 inches of sand was then packed over the cable to complete the protective envelope of sand around the cable. The trench was then refilled.

Police and Fire Department headquarters are located on 26th St. off Avenue C. Two MI cables, each containing seven No. 14 conductors, run underground from the headquarters building to a manhole on the corner of 26th and Avenue C where one cable turns North on Avenue C and the other South. Each single run ties into alarm call boxes on street corners. In each cable 4 wires are for fire alarm signals and 2 wires for police signals. Circuit voltage is 48 volts dc.



CABLE IS PROTECTED from damage by envelope of clean sand tightly packed around cable (shown covered in background, uncovered in foreground).

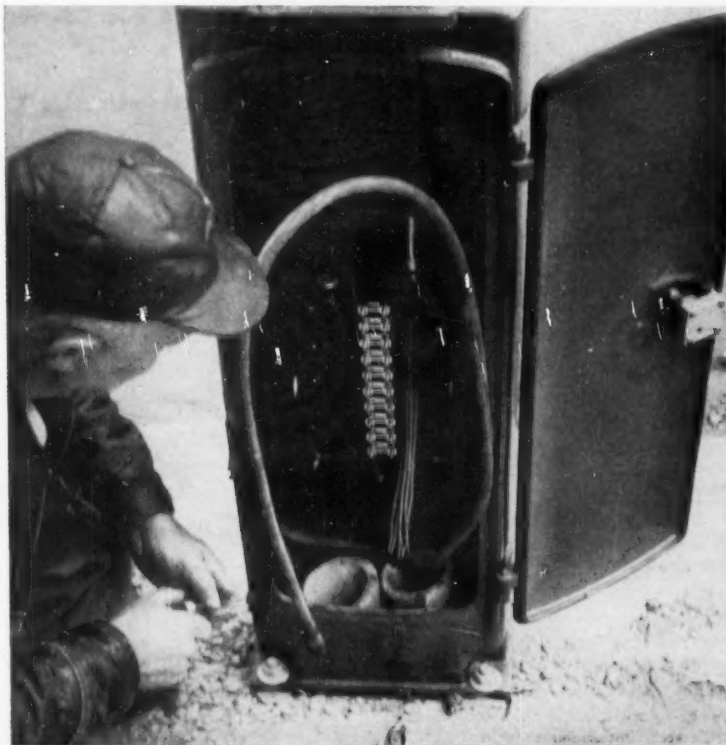


CABLE SPLICE shown here is in manhole at intersection between cable runs from headquarters and runs North and South along Avenue C. Completely sealed connection of seven conductors is made by crimp-type pressure connectors within 2-inch diameter copper sleeve which is filled with compound. Each cable end had first been sealed with special "screw-on pot" type, cold end seal. Threaded end pieces complete copper sleeve assembly. Cable is then taped where neoprene insulation was stripped back on each side of splice.

By Joseph Geiger

*Supt. of Police and Fire Alarm Systems,
Bayonne, N. J.*

TIE-INS TO SIGNAL call-boxes on street corners are made from underground cable run, through short curved sections of asbestos-cement duct which run from bottom of pedestals through sidewalk and out under the curb. Cable is direct-lay up to beginning of duct, near pedestal. Special seals and terminations are quickly and simply installed at cable ends. Cable connections to terminal box are made with a threaded-gland fitting through threaded opening.



Range Installation Forms.
Underwriters Laboratories Inc.

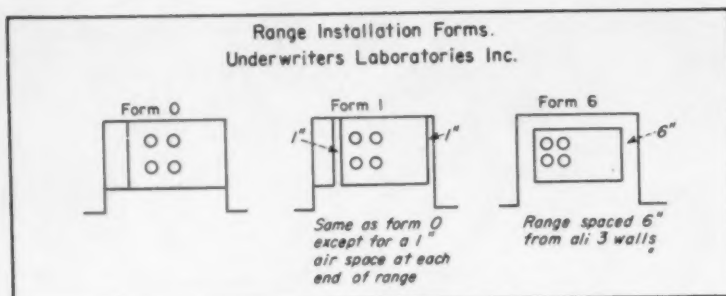


FIG. 1—Form numbers of ranges indicate how it may be installed.

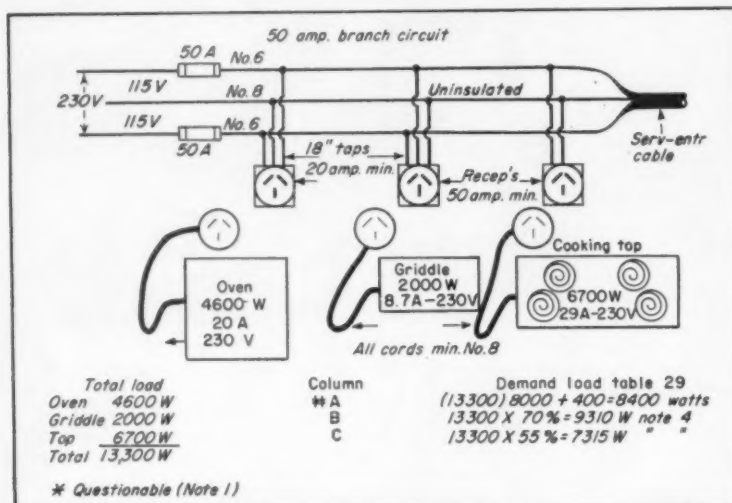


FIG. 2—Use of range circuit to serve cooking components is permissible but not recommended.

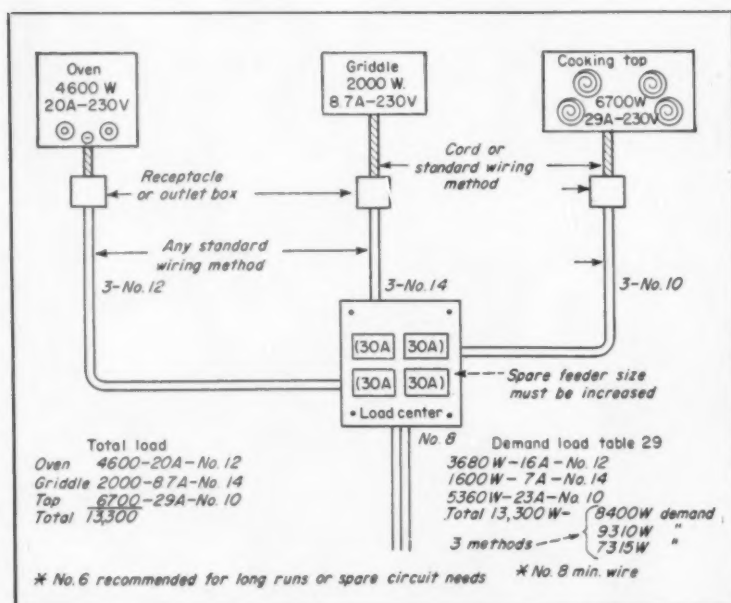


FIG. 3—Individual circuits serving cooking components from load center panel is preferred. Demand data from the N. E. Code.

How to

by B. A. McDonald

QUESTIONS are coming in more frequently concerning the proper installation and wiring of built-in domestic cooking equipment. In this equipment the ovens, the cooking top sections and other components are designed to be installed as separate units located in different parts of the kitchen, and to be recessed in walls, cabinets or counter tops. It appears that a trend favors locating the components of ranges in locations best adapted to their convenient and efficient use, and that a demand for such applications of electrical cooking has increased and will continue to do so as long as our architects, manufacturers and designers continue to explore the possibilities for improvements in kitchen design. As a result, it appears that we may look forward to increased application and extension of the principle involved when range components are isolated with respect to each other and that we, who are particularly concerned with the wiring problems involved, should appraise the various N. E. Code rules with respect to their correct application as the picture continues to change.

Range Installation Forms

Since the components of a range are usually installed in kitchen cabinets or recessed in walls which in both cases usually involve combustible material, it appears very important at this time to review the Code rule which safeguards the hazard presented when ranges or their components are located adjacent to combustible material. Section 4234 of the Code covers this question. It reads as follows:

"Protection of Combustible Material. Each electrically-heated appliance which is obviously intended by size, weight and service to be located in a fixed position shall be so placed as to provide ample protection between the appliance and adjacent combustible material."

This provision, general in nature, with no specific clearances from com-

Install and Wire Built-in Range Components

Interpretation and analysis of Code rules and methods for installing, connecting and wiring multiple component residential electric cooking equipment

bustible material would be difficult for an Inspector to apply if it were not for the valuable assistance given by the Underwriters' Laboratories. It likewise would be impossible practically, in view of the many variables involved, to formulate a Code rule which could equally apply to various designs and conditions of use. The question of clearances is clearly covered by U. L. on page 163 of their 1953 Electrical Equipment List. Fig. No. 1 is a reproduction of the range installation forms set up by the U. L., and any range approved by the U. L. is limited to use as covered by the installation form designation which has been assigned to it, except as modified below.

Form 1 is the same as covered by close against vertical walls at back and oven end and against cabinet base at end having surface cooking units, except that the end wall and cabinet base may be reversed when surface units are placed at oven end providing nameplate of range specifies location of the cabinet.

NOTE: Cabinet base and all walls are assumed to be of combustible material. Cabinet base is not less than six inches wide and has same height and depth as range. Form 0 range is also suitable for installation under the conditions represented by Form 1 and Form 6.

Form 1 is the same as covered by Form 0 except for a one inch air space at each end of range.

NOTE: A range listed under Form 1 is suitable for installation under the conditions represented by Form 6, but not under Form 0.

Form 6 covers a range that must be spaced 6 inches from all three walls and must not be used under the conditions covered by Form 0 or Form 1.

While the above range installation forms apply generally to a complete range assembly as a unit, reference to the U. L. Listing shows in the case of range components of the wall-insert type or for installation in kitchen cabinets that other installation forms

apply which are specifically covered under the manufacturers' individual listing. It is therefore very important that this feature of any type of range installation be thoroughly checked before making the installation. Past experience indicates that neglect in this regard will result in a fire hazard.

Status of Components

A question which frequently arises in the minds of both Inspector and contractor concerns the status of the component parts of a range with respect to Code rules specifically concerned with ranges as a unit. Do the oven, the cooking top and the gridle retain their status as ranges when they are separated into individual units and installed isolated from one another? Do such individual units retain the special Code consideration given to the range as a complete unit or do they become small domestic cooking appliances as this term is generally understood? May they be wired with service entrance cable with a covered neutral and may their frames be grounded to the grounded circuit conductor? These and similar questions often arise. In support of a personal opinion in this respect, I find on page 144 of the U. L. Equipment Listing under the heading of Domestic Cooking Appliances the following notation:

"Range components intended for separate installation in kitchen cabinets or walls such as built-in surface unit assemblies and ovens are listed under Ranges."

This comment appears to indicate that the Underwriters' Laboratories recognize a range component as a range and not a cooking appliance as we understand the term. In further support of an opinion on the question, Section 3382 recognizes the use of S. E. Cable, without individual insulation on the grounded conductor, to be used for wiring a range circuit provided the cable has a final non-metallic covering and that the supply is ac. Section 2560

of the Code permits the grounding of a range frame to the grounded circuit conductor provided the branch circuit is three-wire 120-240 volts and the grounded circuit conductor is not smaller than No. 10. This Code provision appears to indicate a distinction between a range and a cooking appliance in so far as this rule is concerned and also Section 3382 which covers service entrance cable use. Since the capacity of a 3-wire, 120/240-volt, No. 10 circuit would be 30-amp times 240 volts which results in 7200 watts and since such a circuit could serve a 9000-watt range with a demand load of 80%, it appears to me that any range or component of a range which is smaller than 9000 watts could not be wired with service entrance cable with an uninsulated grounded conductor and its frame could not be grounded to a grounded circuit conductor. An exception to this opinion however would occur when a range or component smaller than 9000 watts is served through a 3-wire No. 10 or larger circuit.

Figuring Demand Permissible

The next question concerns the proper application of the demand loads as covered by Table 29 of the Code. As an example, a 12 kw range, as a unit, has a maximum demand of 8 kw. If however the components of this range are isolated from one another, would the same maximum demand hold and could the various components be connected to a circuit consisting of two No. 8 and one No. 10 conductors? Section 2103 of the Code recognizes 15-, 20-, 30- and 50-ampere branch circuits in addition to the individual branch circuit. A range as a unit is usually served by an individual branch circuit. When this same range is broken into components and then served by one circuit, we no longer have an individual circuit and if we wish to serve them on one circuit, it appears that we must use a No. 6 conductor, 50-ampere circuit. Personally,

I am unable to note any difference in hazard between the use of either method. My opinion in this respect is influenced by the fact that we have not altered the conditions of use of the range when we separate the components. We still have a 12 kw load to serve and the fact that it is separated into units should not, and in my opinion will not influence the demand. The use of the equipment will remain the same under either arrangement, as a unit or as separate components. I believe when the present Code provisions, covering both of these questions, were formulated that these questions were not considered. I therefore believe that a fair interpretation of the intent of the Code would require, when all components are connected to one branch circuit, that the demand recognized should be based on the total wattage of all the components and that the size of the circuit conductors should also be figured accordingly.

In order to clarify this opinion, I am showing the points involved, in figuring the demand load for both conditions of use as follows:

A 12 kw range as a unit has a maximum demand of 8 kw, and requires a No. 8 3-wire circuit, neutral No. 10.

When the components are separated, we might have an arrangement as follows:

Cooking Top.....	6000 Watts
Oven	4000 Watts
Griddle	2000 Watts
Total	12,000 Watts

According to Table 29 and Section 2203-d, the demand load for such a combination could be figured by the use of Column A or Column C or B. In the first case, we have three ranges or cooking appliances, each rated, not over 12 kw, and the resultant demand would be 14 kw. It is obvious that this method, applied to the combination in question, would result in a load which exceeds the total connected load of 12 kw by 2 kw. While I do not believe this application was intended, this method of computing the demand is recognized by the Code. In the second case, the demand load may be computed as outlined in the Code by Note No. 4 following the Table. This note reads as follows:

"Over 1½ kw to 8½ kw. In lieu of the method provided in Column A, the load for ranges individually rated more than 1½ kw but not more than 8½ kw may be considered as the sum of the nameplate ratings of all the ranges, multiplied by the demand factors specified in Column B or C for the given number of ranges."

If we use the demand factor specified

in Column B, we would obtain the following result: $12000 \times 70\% = 8400$ Watts. The wording of the note however might be interpreted to indicate that we have a choice between the use of column B or C. If we use column C, we would obtain a demand load of $12000 \times 55\% = 6600$ watts. As a result, we could wire a circuit feeding the components of a range equivalent to 12 kw with No. 10 conductors and fuse them at 30 amperes. I do not believe this was intended for the reasons already covered. It does appear that this question should be clarified in the Code.

Other Wiring Problems

The wiring problems involved with a range whose various components are self-contained in a unit, is simple and clear to all of us. When we separate the components and endeavor to install them on one branch circuit many questions arise. I have shown by Fig. No. 2 one of the methods usually suggested which involves the use of the 50 ampere, 3-wire, branch circuit. I am listing the various questions which arise with such an application.

Question No. 1—Does the Code permit me to use service entrance cable without individual insulation on the grounded conductor for wiring a 50-ampere branch circuit when the load served is limited to the components of a range as shown in Fig. No. 2?

Answer—Section 3382, S. E. Cable Use. It appears to me that this Section recognizes such use, provided that the various components are classified as ranges. I believe both the oven and the cooking top would be so classified, but there could be a question regards the griddle.

Question No. 2—May the neutral conductor of the service entrance cable be No. 8 in size?

Answer—Section 2203-g of the Code recognizes the maximum unbalanced load on a feeder supplying ranges as warranting recognition. 70% of the load on the ungrounded conductors is recognized when computing the size of the neutral. Since this provision has been generally accepted as applying to range circuits, it appears that it would also be recognized in the case covered by Fig. 2.

Question No. 3—May I ground the frames of the components to the grounded circuit conductor?

Answer—Section 2560 permits the grounding of the frame of an electrical range to the circuit grounded conductor provided the range is served by a 3-wire, 120/240-volt branch circuit and the circuit conductors are not

smaller than No. 10. While the branch circuit conductors in the example shown satisfy this requirement, there possibly could be a question concerning the No. 12 Taps made at the receptacles feeding the oven and the griddle. Any question in this regard would be satisfied by using No. 10 taps. Since the griddle requires only 8.3 amperes at 230 volts, its connection to this circuit from a practical standpoint is questionable. If however such procedure was desired, it appears to me that if a No. 10 tap were used, its frame also could be grounded to the grounded circuit conductors. The question of cord size would be satisfied since the minimum size recognized by U. L. for range use is No. 8.

Question No. 4—Could range components as shown be connected by the use of cords to a 50-ampere branch circuit?

Answer—Section 2126-c recognizes the connection of fixed cooking appliances to a 50-ampere branch circuit with no restriction as to size. The term "fixed" as used in this Section recognizes cord connections where otherwise permitted. Section 4241, fine print note, recognizes a plug and receptacle connection for a household electric range. Section 2560 and 2559 indicate that ranges may be connected to a circuit by the use of a plug and receptacle. It therefore follows that the use of cords as questioned would be recognized.

Question No. 5—What is the minimum size cord recognized for use on a 50-ampere branch circuit?

Answer—Section 2403-d recognizes a cord of 20-ampere capacity for use on a 50-ampere branch circuit only when approved for use with a specific appliance. In the case of ranges, the smallest size cord approved by U. L. for range connections is No. 8.

Question No. 6—Could receptacle outlets be connected to the 50-ampere branch circuit shown and could smaller wire be used for making the connection?



Answer—Section 2121-c-2 recognizes taps, not over 18 inches long to individual outlets. Such taps are considered as protected by the branch circuit overcurrent devices as covered by Section 2403-f. The Table under 2127 indicates that such taps shall not be smaller than No. 12. The tap in any case must be of a size sufficient to serve the demand load.

Question No. 7—What is the minimum size receptacle that may be connected to a 50-ampere branch circuit?

Answer—Section 2123-b definitely requires a receptacle when connected

(Continued on page 184)



Conversion from Car barn  to Supermarket  Demanded



Total Electrical Modernization

Thanks to a comprehensive electrical distribution and control system, research-dictated lighting, and an underground package conveyor, this ultra modern market is fast becoming a New England institution. Engineering and wiring is the work of Friedman Electric Company, Inc., of Boston.

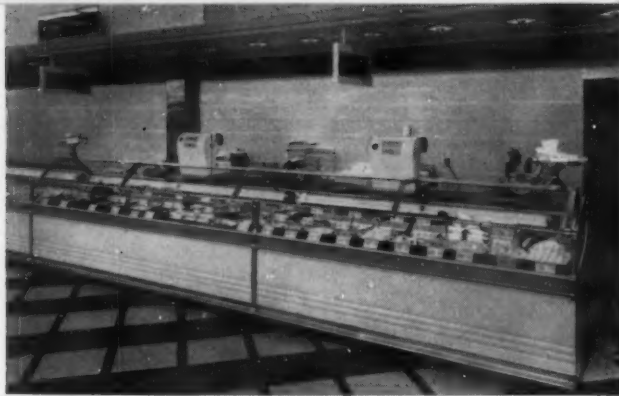
SEVENTH and largest link in a lengthening chain of New England supermarkets is a Star Market unit located on Mount Auburn St., Cambridge, Mass.; an ultra-modern food and merchandising center which, only a short time back, was a down-at-the-heels car barn. Electrically, this transition from barn to market was dramatically complete, for the distribution system was totally revamped from the substation onward, modern lighting was created from scratch, and added services included motorized conveyors, remote controls and automatic temperature regulators, air conditioning and refrigeration, musical trans-

cription and paging facilities, "magic carpet" doors, protective alarms and an excellent grounding system.

Installed by Friedman Electric Company, Inc., of Boston and planned jointly by Paul MacNally and Edward V. Gartland, Jr., engineers for Friedman and Star respectively, the power package includes underground utility feeders, a 3000-amp service switch, compact outdoor substation and several dry-type indoor transformers; an installation that provides 3-phase 4-wire power at 230- and 550-volts plus single-phase 115/230-volt service as well. At present, total motor loads approximate 200-horsepower (units ranging from

1- to 30-hp) while lighting amounts to 200-kilowatts; all circuits being controlled from dead-front sectional-type pane's with either 3-pole extractable fused units in branch circuits of main and power distribution panels, or single-pole thermal circuit breakers with common neutrals in lighting cabinets. For emergency lighting purposes, an auxiliary system, operating from a dry storage battery, is provided with an automatic transfer switch.

Branch circuiting is generally via cable in rigid conduit; the conduits being secured to masonry surfaces by means of metal clips, machine screws and lead expansion anchors, and the



LIGHTING OF GENERAL AREAS is by means of surface-mounted 4-lamp slimline fixtures mounted on the 16-foot acoustical ceiling in continuous rows. Cove treatments, luminous panels and PAR floodlamps in adjustable bullet-shaped reflectors are also used to highlight merchandise.



RECESSED INCANDESCENT FIXTURES, equipped with silvered-bowl or reflector lamps plus annular-ringed louvers, provide color balance and boost footcandle levels in refrigerated display cases and free-standing produce racks. Throughout this giant supermarket, illumination ranges from 60- to 100-fc.

wiring consisting of Type RH rubber insulated or varnished cambric, or (for underground locations) Types RH or RW. Augmenting this general cable-conduit distribution are lesser installations of square wireways, electrical metallic tubing, and armored cable for flexible connections to motors or lighting fixtures. No wire in the installation is smaller than 12 gage, and home-runs over 100 feet in length are 10 gage or larger. All wires are continuous between outlets, they are consistently color-coded and are properly tagged in all pull boxes and panel gutters for accurate identification. To insure even distribution of loads, circuits were balanced between phase legs at all control centers and, after their installation, were rechecked under load, through the use of a hook meter, in order to verify the magnitude of estimated ampere ratings. Feeders to distribution points are liberally sized to prepare for future expansion or rearrangement of the system, and spare breakers are provided in all panels.

Fully realizing and appreciating the value of planned illumination as a merchandising medium, Star Market ap-

proved recommendations for at least 60-fc in all general areas, with 100-fc or more for refrigerated food cases, meat displays and special features.

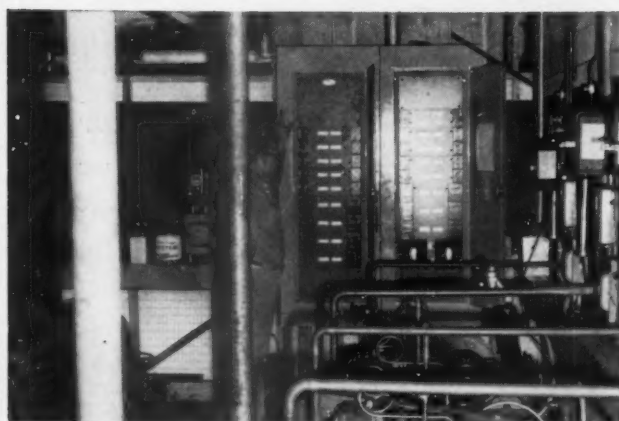
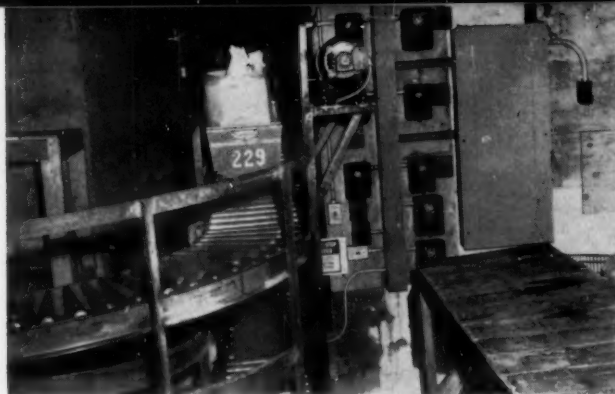
Lighting treatments are varied with area purpose, including continuous rows of 4-lamp surface-mounted bare slimline fluorescent units operating at 200-milliamps in the main sales area; ceiling-recessed units containing 150-watt incandescent PAR spot- and flood-light lamps to boost illumination on counter tops; recessed Alzak reflectors equipped with mogul-base 300-watt lamps; silvered-bowl lamps in recessed annular-ringed fixtures, plus varying lengths of narrow reflectors for end-to-end mounting of single rows of fluorescent lamps.

Selection of these units was not predicated on theory or catalogue data alone, for initial research involved the construction of a full-scale mock-up store section, the experimental suspension of dozens of different luminaires, and actual meter readings of light outputs from fixtures at various mounting heights and with different spacings between units. Various color combinations also were tested for lamps, wall

surfaces and ornamental trim, so that final treatments in the store's interior reflected the findings of research, engineering and human reactions.

This logical approach to the problem of planned lighting also included an analytical comparison of lead-lag with series ballasts for starting and noise-level characteristics, the weighing of 200-milliamper operation against 100- and 300-ma use as a means of brightness control, the evaluation of T-8s against T-12 lamps for esthetic reasons of slimmness, the balancing of 48-inch against 96-inch lengths as a factor in reflector design, the comparison of dual-circuit vs total-installation switching arrangements for operational flexibility and convenience, plus the matching of various louvers and translucent panels for shielding and diffusion.

In addition to this methodically planned illumination arrangement for the merchandising areas, the Star Market lighting system includes both 1- and 2-lamp 96-inch slimline fixtures in the basement, receiving department, stairwells, meat cutting and wrapping rooms. Moreover, watertight outlets are provided for exterior illuminated



ELECTRICAL MAINTENANCE TRUCK is stocked with welding equipment, lamps and starters, replacement parts for motors, test meters, small electrical components and wide selection of hand and power tools. Electrical maintenance men also service air conditioning and refrigeration equipment in seven stores.



DOUBLE-TIER PACKAGE CONVEYOR drops from check-out counters to basement level, continues underground to parking lot, then rises to an outdoor pick-up station where attendants place purchased merchandise in customers' cars. Ten 1-horsepower motors drive the various belt sections.

signs, color-corrected mercury-vapor luminaires are pole-mounted to illuminate the store's 500-car parking lot, and vapor-proof units with RW wire in rigid threaded conduits are used in the walk-in refrigeration chests—the wiring being sealed in conduits where they pass through cold-chest walls, thereby preventing condensation from forming in wireways.

As to electrical services in the 3-acres of floor space which are dissociated from actual display and sales areas, the most extensive is an underground motorized belt conveyor system connecting the 14 check-out stations with a package pick-up station near the exit from the parking lot. This double-tier conveyor, operated by ten 1-hp motors, carries customers' purchases to the car site as fast as customers can walk to their cars so that, as customers drive away, the packages can be placed in their cars by attendants handling this detail. Since customers receive numbered cards as they pay their bills, corresponding to the numbers of their baskets, this package delivery and pick-up arrangement results in fast, easy, accurate sales-

promoting service. Empty baskets are returned to interior check-out points by means of the return tier of belting.

Another electrical service is the "magic carpet" operation of exterior doors, activated when a customer steps on a floor switch beneath a rubber mat at each entrance or exit. Switches are large in surface area, and are adjusted to operate at moderate pressures, so the weight of a customer or the exact positioning of his feet is immaterial.

In the store proper, customers can select meats from a block-long refrigerated case, maintained at 32-degrees; frozen foods can be picked up from a 120-foot refrigerated case retained at minus 10 degrees; and dairy products and ice cream can be lifted from shorter length cases kept at various temperatures. These cases, plus many behind-the-scenes refrigerators and cold rooms, plus the store-wide air-conditioning system, can be readily translated into impressive totals of compressor capacities, automatic temperature controls, automatic signals and alarms and vapor-proof wiring.

Still another area where power is

provided in quantity is a fully-equipped carpentry and maintenance shop, where all displays for Star's seven stores are fabricated, and where all motors, lighting fixtures, power devices and tools are tested, cleaned and repaired. Here one finds band and circular saws, planers, shapers, drill presses, welding equipment, grinders, motor repair facilities, lamp and ballast testers, extensive storage bins and the like.

Adjacent to this shop is a 5-truck garage, wherein the company's five extensively-equipped maintenance trucks are serviced and re-stocked.

This king-sized super supermarket, employing 225 people and serving as many as a thousand customers simultaneously, also contains inter-department communications, paging and musical transcription facilities, a cafeteria with an electric kitchen, 34,000 sq. ft. of selling space, and double that amount never seen by the public. It is fast growing into a neighborhood institution, rendering an unusually high degree of service to the public, thanks to a comprehensive electrical system, a planned lighting installation and numerous motorized applications.



Clinical Center is new home for National Institutes of Health, has model electrical system that provides . . .

Power For Health Research

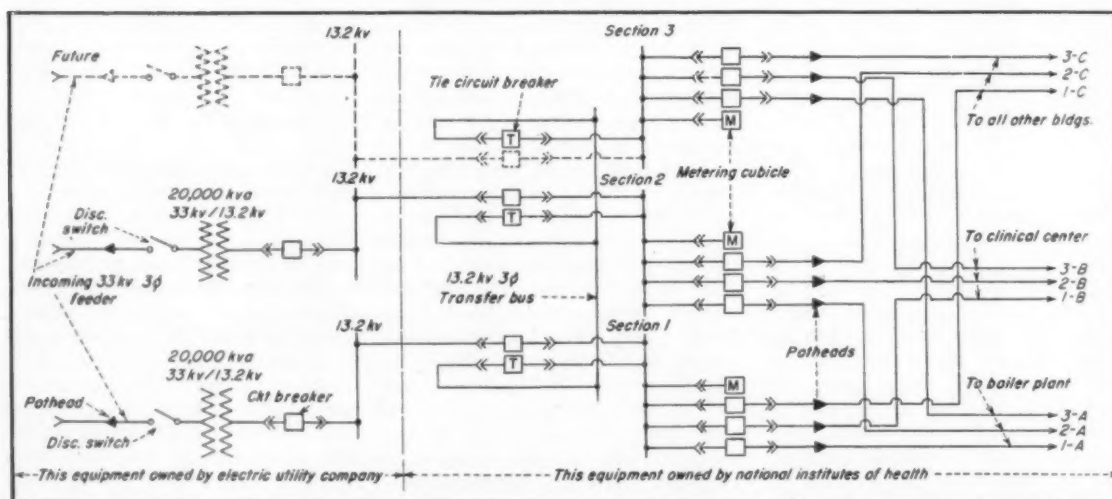
Two main and two emergency power sources supply uninterrupted electrical service to world's largest medical research center, the U. S. Public Health Service's new \$100-million facility.

By Frank J. Muller

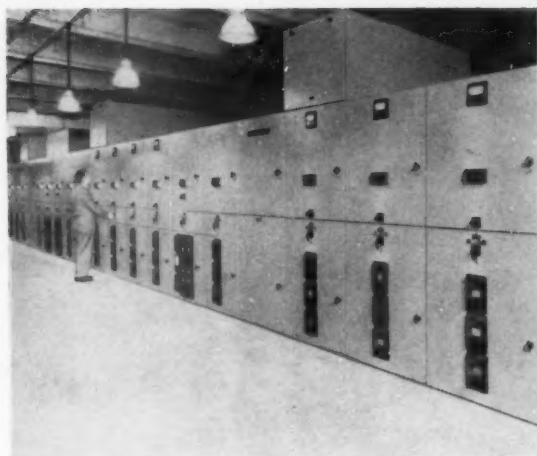
Chief of Electrical Unit
Public Buildings Service
General Services Administration
Washington, D. C.

ELECTRIC power is destined to play a major role in the U. S. Public Health Service's highly important new medical research program. The electrical system for the new clinical and laboratory research facilities of the National Institutes of Health points this up clearly. This system, designed

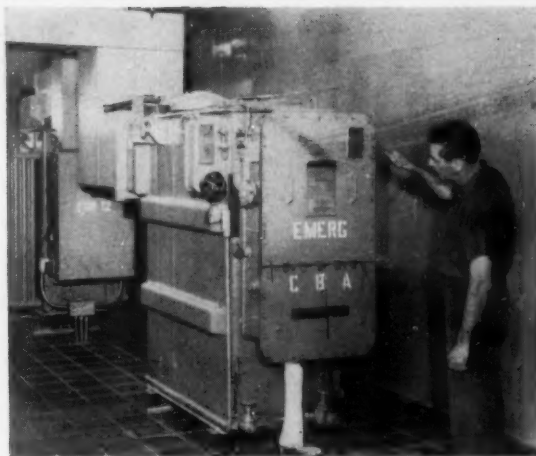
to provide maximum reliability and continuity of electrical service with provisions for changing load conditions and future expansion, incorporates the newest and most modern electric power distribution techniques and design. It is a spot network system which provides good voltage regulation, low



WOODMONT SUBSTATION houses switchgear for power company and National Institutes of Health. Two transformer banks are outside building, supply power to three separate load centers in multi-building project.



SWITCHGEAR controls 13.2 kv power from three bus sections, serving Boiler Plant, Clinical Center building, and all other buildings.



TRANSFORMERS for light and low voltage power in Boiler Plant (rear left) are 500 kva units, with 13.2 kv primary. Emergency transformer in foreground is 300 kva.

power losses, and maximum convenience for operation and maintenance.

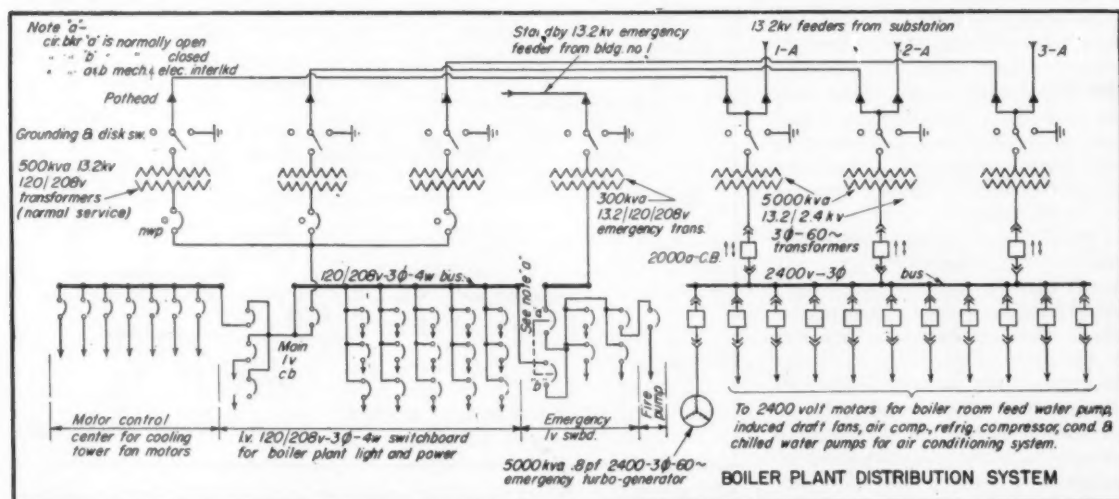
The Public Health Service's new research facilities, to be occupied by the National Institutes of Health, constitutes a health research center that is the largest institution of its kind in the world. Located in Bethesda, Maryland, on the outskirts of Washington, D. C., the center consists of a \$62-million Clinical Center building and some 20 other miscellaneous research and supporting service buildings. The entire project is on a beautiful wooded tract of approximately 256 acres of rolling high ground. It constitutes the setting for a coordinated clinical and laboratory research program in long-term illnesses that are now the greatest causes of disability and death in the

United States. These fields include the heart, cancer, mental health, neurology, arthritis, microbiology and dentistry.

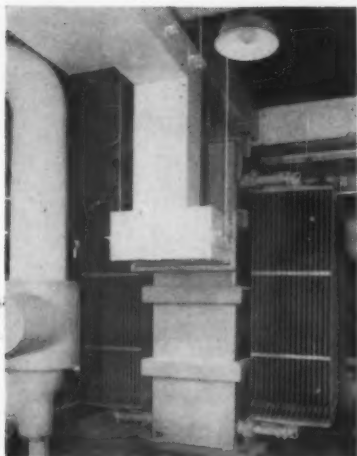
The Clinical Center building combines research facilities with a modern hospital. The building consists of 14 floors, a ground floor, and a basement. It is 779 feet long, 358 feet wide, and has approximately 1,246,900 square feet of floor space. It has 500 hospital beds, and nursing facilities, in addition to medical research and experimental laboratories, operating rooms, x-ray rooms, refrigeration, temperature, and humidity control rooms. It has 12 passenger, and four service elevators, and four dumbwaiters. It also has two auditoriums with stages, complete with modern projection, sound, and stage

lighting equipment; one chapel for religious services with rotating platform containing the altars for three faiths. In addition there are facilities for automatic animal cage and laboratory glassware washing and sterilization, a cafeteria and kitchen with capacity to serve the whole institution. Other areas include a gymnasium, bank, post office, beauty parlor, barber shop, snack bar and drug store. About three-fourths of the floor area is devoted to laboratories.

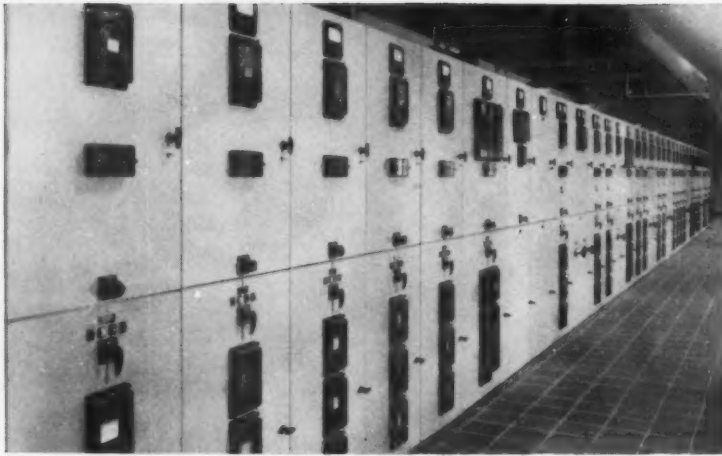
A power system with a connected transformer capacity of 40,000 kva has been installed to supply the electrical demand of this project. Provision has also been made for future installation of another 20,000 kva transformer to supplement the two already installed. The primary services to these two



BOILER PLANT substations are fed by three 13.2 kv feeders and one 13.2 kv emergency standby feeder. Three 5,000 kva transformers supply 2400-volt 3-phase bus for motor loads, and three 500 kva transformers supply 208/120-volt 3-phase 4-wire power.



2400-VOLT end of 5,000 kva transformer, 13.2 kv primary, serving air conditioning motors.



SWITCHGEAR BANK for 2400 volt motors in Boiler Plant is reportedly longest ever built. It is installed on balcony area near the motor load center. Transformers are banked on the first floor, serve this switchboard over shortest run.

transformers are two 3-conductor 33 kv cables, each coming from a separate substation of the local electric power company. The 33 kv services are transformed to 13.2 kv at Woodmont substation on the premises, and distributed to point-of-use in the various buildings at this voltage. Nine 13.2 kv feeders, each consisting of three 350-MCM or three 500-MCM conductors, are utilized for services to the various spot network units throughout the project, and are run underground. Three of these feeders serve the main Clinical Center building, three serve the Boiler Plant and air-conditioning machinery, and three serve all other buildings. Should one of the 33 kv feeders fail, the total load is supplied by the remaining feeders. Should the second feeder fail all loads are automatically disconnected and only designated loads are supplied by an emergency 5000 kva turbo-generator located in the Boiler Plant and a separate standby emergency 13.2 kv 2000 kva capacity feeder of the local power company supplied from a separate power company substation. A third emergency service is also provided from stand-by storage batteries for the operating rooms.

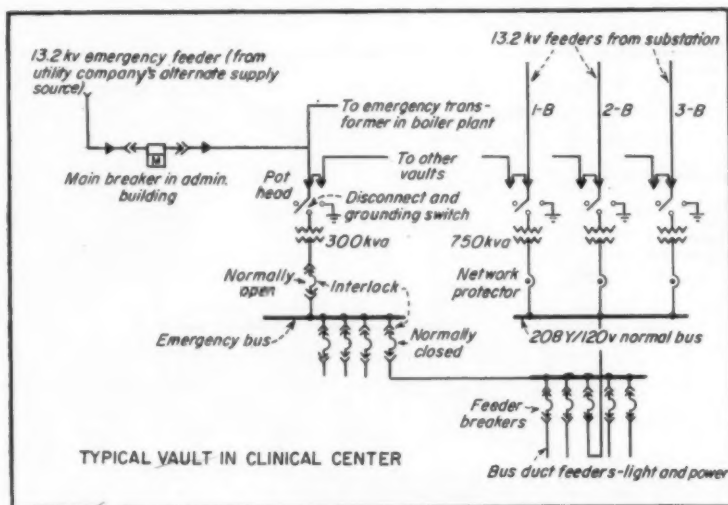
One of the most important design characteristics of the power system was that it must be very reliable. Good voltage conditions also had to be maintained. These requirements were met by the application of automatic tap changers on the primary 20,000 kva transformers, spot network type of distribution system; low voltage drop through the use of unit substations at various load centers and LVD bus duct for secondary risers.

All of the main 13.2 kv service distribution originates in a completely

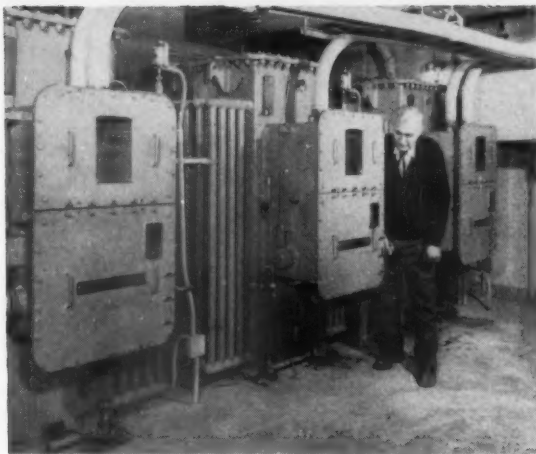
housed substation located on the project grounds near the main highway. Here-in are located the main feeder service metal-clad switchgear units. The main bus to which the feeder switchgear units are connected is divided into three sections, each section connected with tie breakers which are normally closed. Each bus section feeds three main 13.2 kv feeders. The main bus sections are fed with two 13.2 kv service feeders through two air circuit breakers, equipped with reverse current protection to prevent the flow of current from the 13.2 kv bus to the 33 kv system, and inverse time overcurrent phase and ground relaying. Feeders are connected in parallel to the main bus

to provide continuity of service in the event of failure of one of the main 33 kv feeders. Provisions are made in the switchgear arrangement and bus for the installation of a third 13.2 kv service feeder and space for three future outgoing feeder circuit breakers. All of the air circuit breakers in the substation are rated 15 kv, 1200 amperes with an interrupting capacity of 500,000 kva. Provisions are made in the metal-clad switchgear for mounting the power company's metering transformers.

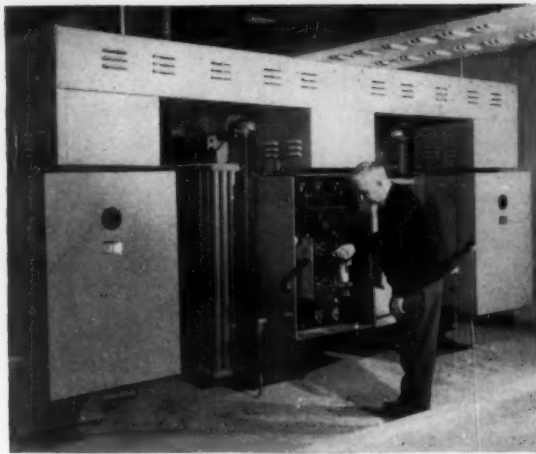
All circuit breakers and associated controls in the 13.2 kv and 2.4 kv switchgear are dc close and dc trip operated. Two nickel iron alkaline, 90



POWER SYSTEM hook-up for typical transformer vault in Clinical Center building. Primary feeders supply power to 750 kva transformers at 13.2 kv from Woodmont substation, and 13.2 kv from alternate utility company source supplies 300 kva emergency transformer. Note emergency hook-up.



PRIMARY side of three 1000 kva network transformers in typical power center in Clinical Center building. These centers are distributed throughout building close to loads they serve.



SECONDARY side of three 1000 kva network transformers in Clinical Center building, with door open to show network protectors. Note metal housings overhead for high amperage ducts.

cell, 225-ampere at the five hour rate, batteries with two battery charging motor-generator sets are installed to meet the dc power demands in the Boiler Plant. The battery charging and distribution panel is so designed that one battery may be floated on one charger to supply the control demand while the other battery is being given a charge from the other charger. Switching is provided so that both batteries can be connected to the control bus at once, but is interlocked so that the charging generators will not be in parallel. A similar battery and charging equipment is installed in the substation, except that this installation consists of one battery of 60 cells, lead acid 190 amperes at the one minute rate and one charger.

The electrical services to all buildings are run through underground fiber duct lines encased in concrete with concrete manholes. All of the main 15 kv main feeder cables are lead covered, grounded, shielded and paper insulated. Approximately two miles of 350,000 MCM and four miles of 500,000 MCM 15 kv cables have been installed for the main distribution feeders.

Boiler Plant

Power is supplied to the Boiler Plant by means of three 13.2 kv feeders and a 13.2 kv emergency feeder. Power is utilized at 2400 volts three-phase, and at 208/120 volts three-phase four-wire. The large air-conditioning machinery is supplied at 2400 volts through a substation with a transformer capacity of 15,000 kva. The lighting and various other power loads are being served with 208/120 volts through a substation with a transformer capacity of 1,500 kva.

The air-conditioning machinery installation comprises five 1250-hp synchronous motor driven compressors, five 200-hp synchronous motor driven chilled water pumps, and five 75-hp induction motor driven condensing water pumps. Other motors served at 2400 volts are as follows: two 400-hp synchronous motor driven boiler feed pumps and four 60-hp induction motor driven draft fans. All of these 2400-volt motors are designed and installed for full-voltage starting.

Power for these motors is supplied through a master unit substation, consisting of three 5,000 kva Askarel-filled three-phase transformers. The transformers are paralleled on the 2400-volt switchgear bus through three main secondary reverse current air circuit breakers. These breakers are part of the metal-clad switchgear forming a switchboard containing the control circuit breakers for the large motors. Provisions are made in the layout for future additions of refrigeration equipment.

Metering is supplied to indicate bus voltage, transformer current and kwhr consumption.

The emergency turbo unit is located in the Boiler Plant and is rated 5,000 kva, three-phase 60-cycle, at 2400 volts (normal full load).

Primary purpose of this turbo-generator installation, and its operation, together with all of its associated switchgear, etc., is to provide an adequate and dependable source of electrical energy for services which will be classified as "vital services".

This unit is to be connected to normal service feeders only in the event of failure of both of the 33 kv main serv-

ice lines of the power company, and only predetermined loads equal to the capacity of this unit will be connected. The generated voltage of 2400 volts is transformed to 13.2 kv—the normal service feeder voltage—utilizing one of the 5,000 kva transformers normally supplying the air-conditioning machinery. The transformer and 13.2 kv feeders normally supplying the Boiler Plant are used in reverse to supply 13.2 kv to the substation bus, which in turn serve the outgoing feeders to the project. This generated voltage can be utilized in addition to the 13.2 kv 2,000 kva stand-by emergency feeder supplied by the local power company. One emergency transformer of 300 kva capacity is installed and connected to the emergency feeder to supply the vital services for plant operation in the Clinical Center in the event of failure of the normal 13.2 kv feeders.

The Boiler Plant also houses the oil fired boilers, incinerator, and the automatic conveyor belt can-washing machinery.

Clinical Center Building

Electrical power is supplied to the Clinical Center building by three 13.2 kv feeders from the main substation, and by one 13.2 kv emergency feeder from a separate utility company source. The three main feeders supply six spot network units having a total transformer capacity of 14,950 kva, while the emergency feeder supplies three transformers having a total capacity of 1500 kva. Each of the six vaults consists of a spot network generally containing three transformers, with one transformer being supplied from each of the three primary feeders.



BUS DUCTS are run in special equipment space in ceiling from transformers to switchgear to distribution panels.



TYPICAL switchboard for 120/208-volt secondary power and light loads in Clinical Center building.



EMERGENCY transformer of 500 kva capacity and associated switchgear—one of three in Clinical Center building.

Three of the transformer vaults contain one emergency transformer each which is normally energized at all times from the 13.2 emergency feeder. Should the normal main feeders fail, the emergency section of the secondary switchboard is automatically transferred to the emergency feeder and transformer by means of transfer breakers separating the main bus from the normal bus. When energy is restored to the normal bus, pushbutton stations located in the main substation transfer the emergency load back to the normal bus.

Each of the network transformers in each vault is fed from a different 13.2

kv feeder. Should one of the feeders fail the remaining transformers in each unit will carry the load.

All the network transformers are Askarel-filled three-phase 13.2 kv, with 208/120-volt three-phase secondary, and are paralleled through network protectors to the secondary switchboard bus.

Each transformer is provided with a three position disconnecting and grounding switch on the primary end, and a network protector on the secondary end. The disconnecting switch is supplied with an electrical interlock to prevent its operation when the transformer is energized. The secondary

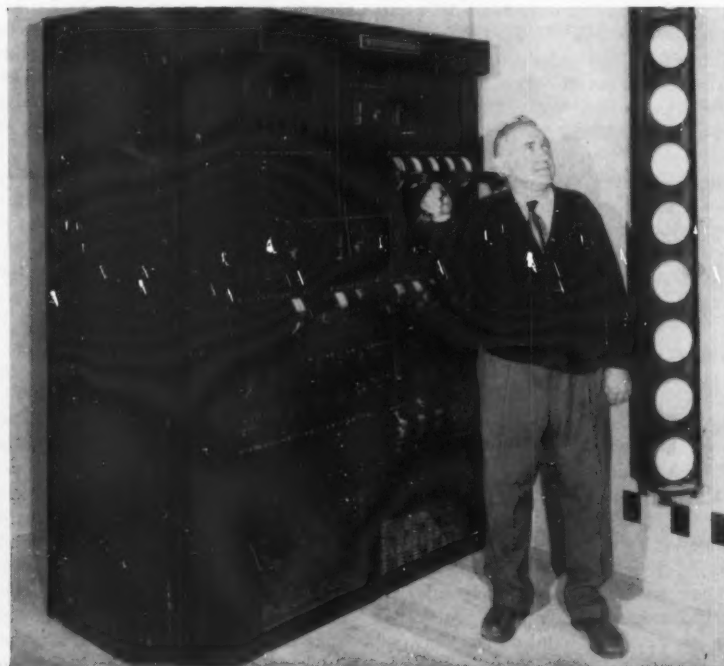
paralleling connections between the transformers and connections to the low-voltage switchgear are made through busway. Metering is provided to indicate bus voltage and transformer current. The network feeds a switchboard of low-voltage drawout switchgear containing the feeder air circuit breakers.

Secondary Distribution

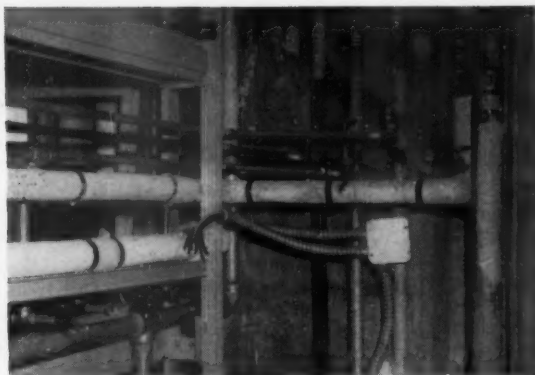
Power at 208/120 volts is distributed from switchboards in transformer vaults by risers consisting of LVD busway. They feed lighting and power distribution panels located on all floors of the building, the unit control motor load centers for ventilating equipment, and the draw out circuit breaker load center switchboards for the elevators. Busway was selected rather than cable because its use results in less voltage drop, is easier to install, requires less space and has a lower installed cost.

A transformer supervisory system is installed to provide remote visual and audible indication of conditions on the power system. The supervisory control will cause tripping of the network protectors and associated incoming circuit breakers in case of extreme over-temperature or over-pressure conditions in the transformers. Remote indication is provided on an annunciator to show the position of all network protectors and associated high voltage circuit breakers on the system. The supervisory annunciator and control board is located in the Boiler Plant. Rubber covered, neoprene jacketed control cable extends to all units in the various buildings through the underground duct line system. Terminal boards in waterproof junction cabinets are installed in manholes for termination of cables.

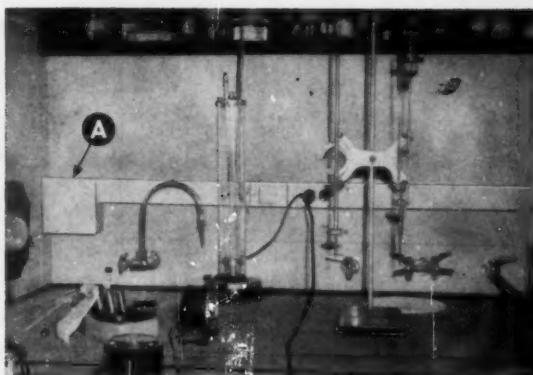
Three 13.2 kv feeders and two underground transformer vaults supply elec-



DIMMER switchboard controls auditorium and stage lighting, has master and remote control.



MOVABLE PARTITIONS are used to form all small laboratories and private office areas. Branch circuits for convenience outlets are fed from junction boxes in fixed building walls.



WIRE RACEWAY attached to movable partitions contains outlets on four-foot centers. Circuits are fed from fixed wall junction boxes through special fitting A above.

trical power to the Laundry & Shops building. Each vault contains two 750 kva transformers connected in a spot network system, with secondaries paralleled through network protectors to common buses in each vault. From the secondary buses underground duct lines and cable extend to the main switchboard in the building. The feeder cables between buses and switchboard are protected with fused cable limiters. Bus duct is used to feed all lighting and power distribution panels.

A 208/120-volt emergency feeder also is installed for this building. The feeder is connected to the emergency section of the switchboard in the Boiler Plant.

Street Lighting System

Power for street lighting is supplied by four 6.6-ampere series circuits. Circuit No. 1 is connected to the 2400-volt energy source in the Administration Building. Circuits Nos. 2 and 3 are connected to the 208-volt secondary switchboard with control equipment in the Clinical Center building, and Circuit No. 4 is connected to the 208-volt secondary switchboard with control equipment in the Boiler Plant.

All circuits are controlled by astromonic time switches: circuit No. 1 through an automatic remote control oil switch, and circuits 2 to 4 inclusive through automatic control contactors.

Located in the various transformer vaults are two 15 kv, one 20 kv, and one 10 kv constant current Askarel-filled transformers with 6.6-ampere secondaries and control equipment.

Group lighting series subway type transformers [6.6-ampere primaries, and secondaries with built-in film cut-out protective devices] are installed in the various manholes. These transformers are provided with easily detachable couplings for circuit isolation

and testing. Series-multiple transformers 6.6-ampere primary and 120-volt secondary are provided for service to units for flood and sign lighting.

Disconnecting potheads are also provided in the various circuits in manholes and in the base of each street lighting standard for isolation of circuits and to each luminaire.

Throughout the project are 152 lighting standards. On the main heavy traveled roads 4000 lumen lamps are used, while 2500 lumen lamps are on the side and lesser-traveled roads.

Street lighting standards are of three types: twin bracket, single bracket, and single light upright poles. All standards are equipped with disconnecting potheads and are set on concrete bases. Fibre conduit elbows are set in the concrete bases for entrance of the circuit wiring. Street lighting cables are rubber insulated, heavy duty neoprene jacketed, non-shielded-type and are generally buried in the ground.

Miscellaneous Services

Low-voltage signal and electronic systems as follows are used in this project: fire alarm, watchman's reports, sprinkler supervisory, central control electric clock, nurses' call, radio and television, doctors' paging, oxygen alarm, vault alarm, dumbwaiter signals, sound amplifying, electric pneumatic door operations and telephone; also an underfloor duct system for power signal and telephone services.

A telephone PBX switchboard room is provided which has sufficient telephone facilities for the entire project. At present there are 13 operating positions in use.

Provisions are made in two of the major operating rooms of the Clinical Center building for televising opera-

tions and projecting same on the motion picture screen in the auditorium.

Fluorescent lighting units of standard Public Buildings Service design are used to light all offices, corridors, and laboratory rooms and for general illumination in the operating rooms. Incandescent lighting units are used to light the operating tables, bedrooms and nursing duty areas.

Battery and charging facilities for battery-operated trucks are installed in the Clinical Center, Animal, and the Laundry and Shops buildings. Individual selenium battery chargers for each industrial truck capable of charging either the lead acid or nickel iron alkaline storage batteries are provided.

This project is another example of a growing trend in modern electrical system design using power distributed at a medium voltage (13.2 kv) to load centers where it is transformed to utilization voltages (208/120 volts and 2400 volts), and the use of metal-clad drawout switchgear of adequate interrupting capacity, spot network units fed from separate high tension feeders for continuity of service, and LVD bus duct for low voltage feeder distribution.

Electrical contractors for this project were Joint Adventurers, a joint venture between the firms of Harry Alexander, Inc., E. C. Ernst, Inc., and The Howard P. Foley Company, all of Washington, D. C. Project superintendent was E. G. Statter. John McShain was the general contractor. The electrical power system, lighting, and all miscellaneous electrical services were designed and drawings and specifications prepared by the Electrical Unit, Public Buildings Service, General Services Administration, Washington, D. C. Architects for the project were from the Architectural Unit of PBS.

Checking the Compound Wound DC Motor

By **Walter J. Prise,**

Chief Engineer, The Maintenance Co., Inc., New York, N. Y.

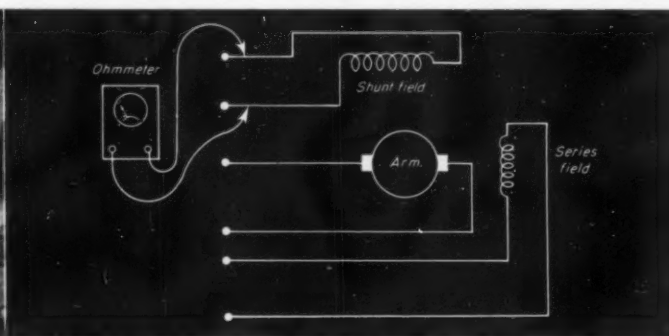
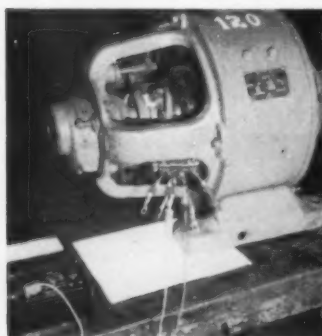
A COMPOUND wound dc motor has three major parts: armature, shunt field and series field. These must be properly connected for safe and efficient operation. The illustrated discussion here covers identification of leads and check for ground on those compound motors which have six leads coming out of the frame—two leads for the armature, two leads for series

field and two leads for shunt field.

In making the checks shown here, an ohmmeter is used for identification of leads; a megohmmeter, for the ground test. Identification of leads is based on fundamental characteristics of the motor: the shunt field consists of many turns of small wire and is of much higher resistance than the armature or series field; the armature leads are

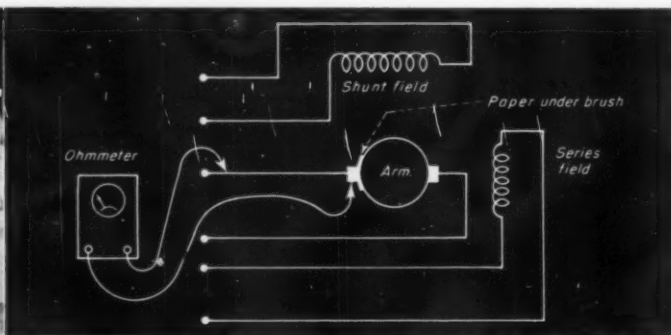
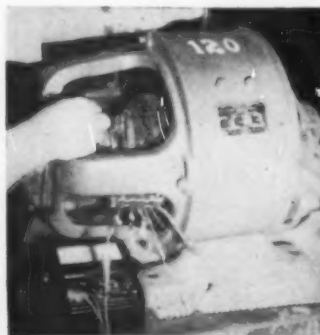
connected to the brushes; and the series field has very low ohmic value. Ground test consists of megohmmeter readings between motor leads and the frame which represents ground.

A test lamp can be used for these checks instead of an ohmmeter. In the check for shunt leads, a lamp may not glow at all, but continuity will be indicated by a spark.



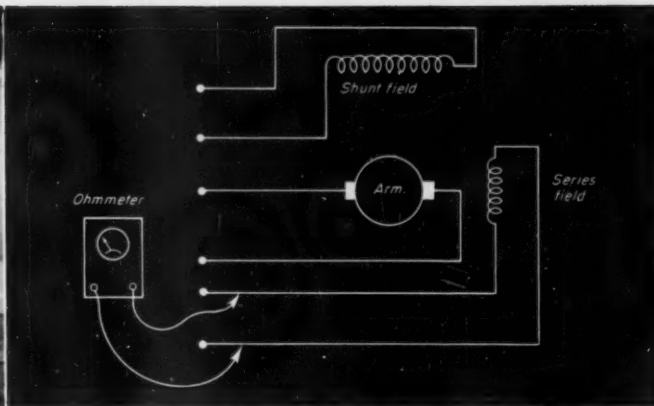
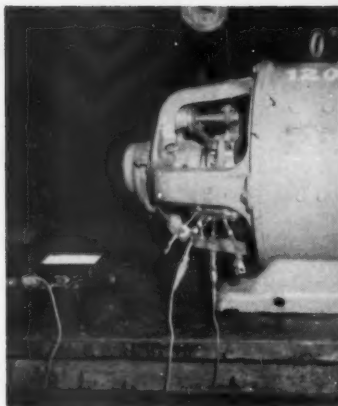
STEP 1. *Identifying the shunt field leads.* By trial and error, find the two leads which give a high resistance reading when measurement is made between

them (not an infinite resistance reading). Shunt leads are often smaller gage than other leads. Visual determination of leads, however, is not reliable.



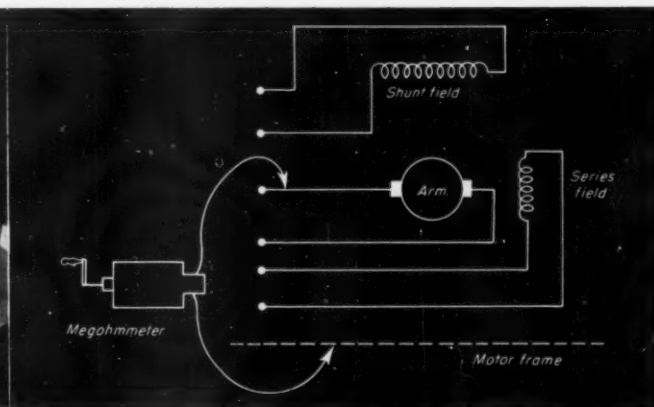
STEP 2. *Identifying the armature leads.* Put one meter clip on one of the brushes, and insulate this brush from the commutator with a piece of insulating paper. By moving the other probe from one to the other of the remaining four unidentified leads, one lead will be found to have continuity with the brush. This then is one of the armature leads. The

other armature lead can be found in the same way. This check indicates which lead goes to which brush (positive or negative). Simply to determine which two leads are the armature leads, one meter probe can be put in contact with the commutator and the other probe moved among the leads until two having continuity with the commutator are found.



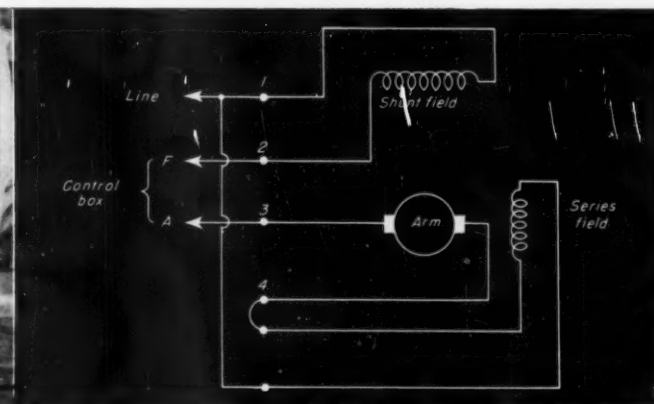
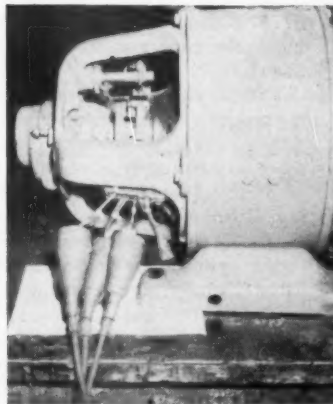
STEP 3. Identifying the series field leads. After the two shunt field leads and the two armature leads have been identified, the two remaining leads are the

series field. To check, a meter reading between the two series field leads should indicate the characteristically low resistance of the series field winding.



STEP 4. Checking for ground. With one clip from a megohmmeter connected to the motor frame, the other meter clip should be connected in turn to each of the motor leads and a check made on the resistance between each lead and the frame (ground).

Low resistance reading indicates ground. A test lamp serves well for ground checks. If a ground exists on any winding, the test lamp will glow when connected between the frame and a lead to the faulty winding.



STEP 5. Connecting motor after identification of leads. One end of shunt field and one end of series field are joined together and connected to line (1). Other end of shunt field is connected to "field" ter-

minal on control box (2). One armature lead is connected to "Armature" terminal on control box (3). Other armature lead and remaining series field lead are connected together (4).



DUPLEX RECEPTACLES on sturdy floor beam above stanchions are for dehorners, clippers and milking machines. One receptacle serves two cows. Good lighting facilitates chore work at all times.



DISTRIBUTION PANELS of the "push-matic" type control some 28 circuits serving the barn and milk house.

Rewiring Puts a Farm on its Feet

New service and more circuits feature conversion of old farmstead into the modern Koym dairy farm near Rock City, Illinois. Electric supply firm owner puts adequate farm wiring ideas into practice.

ELECTRICIANS were busy installing new circuits and service equipment and burying cables underground between buildings on an old farm on Route 75 just east of Rock City, Illinois. Power tools were humming as the farmhouse, barn and out-buildings were being remodeled and a new milk house and silo were being constructed. The farm had been a rundown but sturdy old place before Arthur Koym, owner of Koym Electric Supply at Freeport, Ill., had purchased it. Now it is rapidly being transformed into a modern dairy farm.

Knowing his background, Koym's friends and farm neighbors were anxious to see if he would practice what he had preached to them for years—adequate farm wiring and electrical convenience. It wasn't long before they had a chance to see for themselves. More than 200 farmers responded to invitations, on the Stephenson County Farm Bureau letterhead, asking them to attend a demonstration of a bulk milk pickup at the Koym farm.

After watching Grade-A milk being pumped from milk-cooling equipment in the new milk house direct to Dean

Milk Company bulk hauling trucks (an operation repeated daily), the farmers toured the remodeled buildings. What they saw soon became the talk of the county. Arthur Koym and his tenant, Loyd Earl Walton, have "gone electric" in a big way. Power and light is transforming the property into a model of efficiency. Maximum use is being made of electricity for greater convenience, scientific care of stock, and improvement in purity and quality of milk.

Wiring Details

Interest naturally centered around the barn and milk house—the nerve center of a dairy farm operation. The barn has a new cement floor and concrete retaining walls; moisture-barrier type insulation on ceilings and walls. A large ventilating fan, belt-driven by a $\frac{1}{2}$ -hp motor, provides air circulation the year round; keeps the cows "quieter than most" as one farmer observed. Plenty of overhead outlets provide convenient plug-in facilities for electric clippers, dehorners and milking machines. Ample lighting permits chores to be done regardless of natural lighting conditions.

The new milk house has an electric water heater, water softener, bulk milk cooler, thermostatically controlled supplementary electric space heater, two exhaust fans, and electric pumps for bulk loading of milk.

At present, the house has some nine electrical appliances including a new water well and pump and freezer. When the service is changed to 110/220-volt, single-phase, 3-wire, more electrical conveniences will be added.

New service to the barn is 110/220-volt, single-phase, 3-wire. There are a total of 28 circuits originating in three pushbutton type, circuit breaker distribution panels. For interior wiring, Koym selected two-conductor and three-conductor, neoprene jacketed, fungus-resistant, non-metallic sheathed cable (Durall). As remodeling of other buildings progresses, he plans to use neoprene covered, direct burial, cables between buildings. Overhead service cables are of the single-conductor, rubber-insulated, neoprene-jacketed type.

Throughout the rewiring, owner Koym has made provisions for future requirements, knowing that the light and power load can only go "up".



CABLE IS double-stapled on heavy floor joists. This run terminates in a metal outlet box to which a porcelain lamp receptacle is being mounted.



CHOICE OF non-metallic sheathed, neoprene-jacketed, fungus-resistant cable to weather barn "atmosphere" is explained to neighboring farmer by owner Arthur Koym (center).

Electrical "Hired Hands" on the Koym Farm

Barn and Milk House

- Hay-Drying Unit — 5 hp.
- Milking Equipment powered by ½-hp motor on vacuum pump
- Barn Ventilating Fan — 7,500 CFM belt-driven unit
- Electric Clipper
- Electric Dehorner
- Electric Heater — thermostatically controlled — in Milk House (used only in sub-zero weather)
- Electric Water Heater in Milk House
- Ventilating Fan — 16 in. — in Milk House
- Exhaust Fan — kitchen type — for Milk House shower room
- Bulk Milk Cooler
- Electric-Powered Pumps for bulk loading of milk

Farm House

- Electric Pump and new water well
- Electric Freezer
- Electric Refrigerator
- Electric Window Fan
- Radio
- Television Set
- Vacuum Cleaner
- Electric Iron

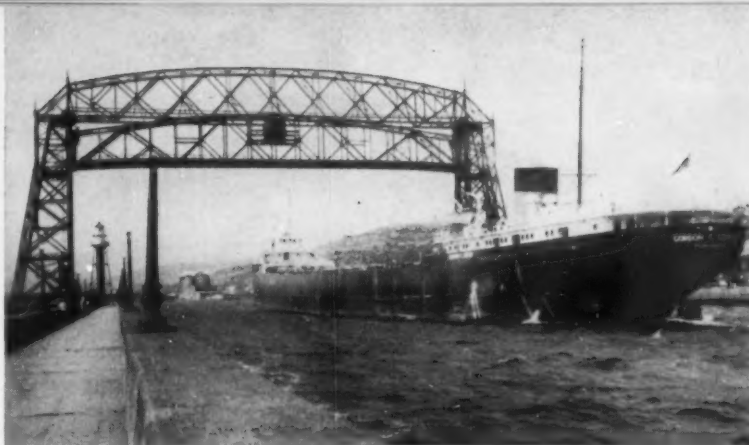


LARGE EXHAUST FAN in barn operates year round; circulates air and cools in summer; exhausts "barn-air" in winter. Unit is belt-driven by a ¼-hp motor.



IT'S A SNAP to keep cows sleek and trim with electric clippers. Tenant Walton just plugs them in outlet above as he goes down the line.

VERTICAL LIFT BRIDGE operates 30 times a day, with center span rising 120 feet above water level in 55 seconds. Bridge-lifting motors are operated by storage battery which, in turn, is kept charged by utility-powered motor-generator set.



Batteries Cut Power Bills

Storage battery, kept charged at steady low-demand rate, provides an abundance of intermittent high-demand power for raising 900-ton aerial bridge. Reduced utility charges and a high order of reliability are the dividends.

A LITTLE known fact concerning a well-known landmark is that motive power for raising the Duluth Harbor-Lake Superior canal aerial lift bridge is supplied by a 153-cell storage battery—a method which has resulted in overall electrical economies and positive reliability.

Utility power required to operate essential motor-generator battery-charging equipment is used at a steady, low-demand rate, even although the power required to raise the huge bridge structure is required in intermittent heavy-demand cycles. This means that the peak-demand charge from the utility company is low, and the resulting power charge is considerably less than it would be if bridge-raising motors were directly connected to utility-supplied switchgear.

The reliability claim is also a logical one, for power failures caused by storms are improbable and, even should this occur to primary service, auxiliary charging facilities are available in the form of a stand-by gasoline engine.

The 153-cell Gould-National battery in use is rated at 800-amps for 8 hours and, during a busy day, this capacity may be discharged as much as 25%, then brought back to full rating during slack night-time intervals.

Actual lifting of the 900-ton bridge is by means of two Westinghouse 95-



BATTERY OF 153 CELLS supplies power in large intermittent amounts for raising the bridge, yet it is kept charged at a constant rate by an m-g set. This results in lowered utility charges, since peak demands are eliminated in billing.

horsepower dc series mill type motors.

Due to the intermittent operation of the bridge, the load factor of the installation is only 50%, yet the peak demand rate of the motor-generator diverter-pole constant-voltage battery-charging equipment averages 85 amps at 330 volts.

Primary power at 440 volts is delivered in conduit via 3/0 cables, and utility bills average \$1500 per season. Without the battery installation it is estimated that these annual charges would be at least doubled, so the installation is proving a good investment.

Time required to lift the span to a

height of 120 feet—thereby permitting the passage of ore boats between harbor and lake—is 55 seconds. And, during an average day, the bridge operates approximately 30 times. During a normal 250-day April-to-November open-water season that the canal is in use, this bridge operates about 3000 times, yet battery failure has been unknown. This power system, planned by Westinghouse engineers, was installed by the Commercial Electric Company of Duluth, Minnesota, and it is operated and maintained under the supervision of Chief Engineer Alfred L. Hass.

take a simple bolt... for instance

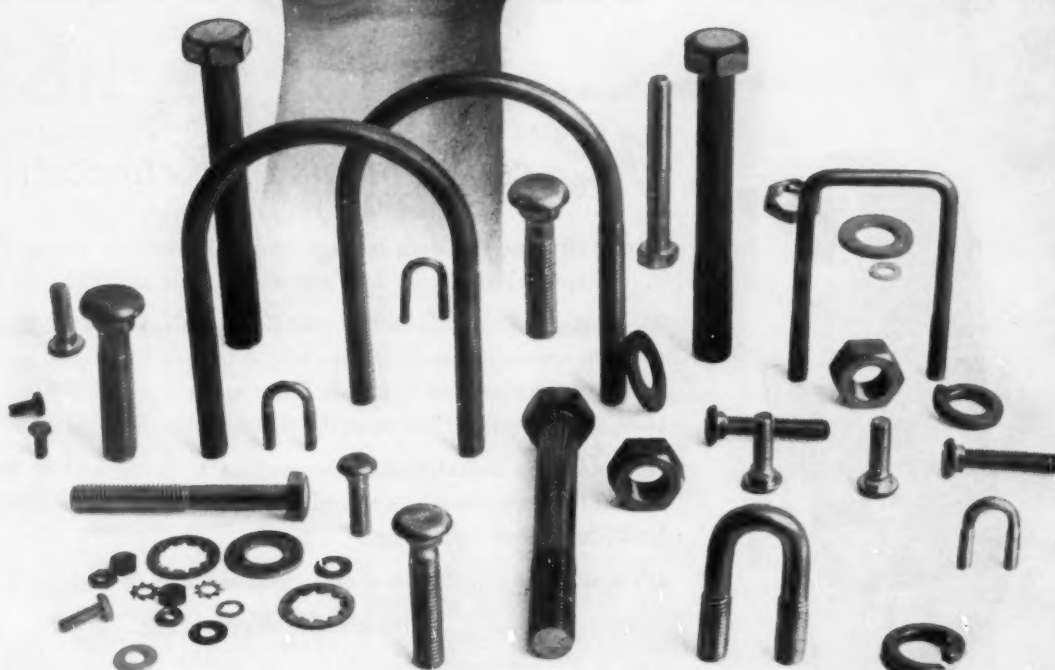


— how much better can it be?
Plenty. When it's made by Burndy, it's made of Durium, the corrosion-resistant silicon-bronze alloy; *cold-worked* for extra strength; the threads are *rolled* instead of cut, to *retain* the strength; the cold-worked heads are integral with shanks, with fillets that prevent cracks at junction of shank and head.

Burndy bolts — nuts — washers — *all* help to insure tight, strong, corrosion-free connections with *low* contact resistance.

Quick Delivery on all orders . . . anywhere in the U.S.A. . . from large warehouse stocks.

For complete catalog and prices, call nearest Burndy representative listed in phone book, or write to Burndy headquarters.



BURNDY

NORWALK, CONNECT. — TORONTO, CANADA • *Factories:* NEW YORK, CALIF., TORONTO • *Export:* PHILIPS EXPORT COMPANY



Here's large caliber ammunition for your adequate wiring fight

compliments of Kennecott!

Kennecott aims an all-out barrage against inadequate wiring. The enemy ... weak, overloaded household circuits ... is on the run!

The strategy: Every month this year Kennecott explodes a full page advertisement such as the one across the way. A total of 15,130,000 readers of the Saturday Evening Post and This Week are told why broilers don't broil, toasters don't toast, living room lights are forever dimming on and off.

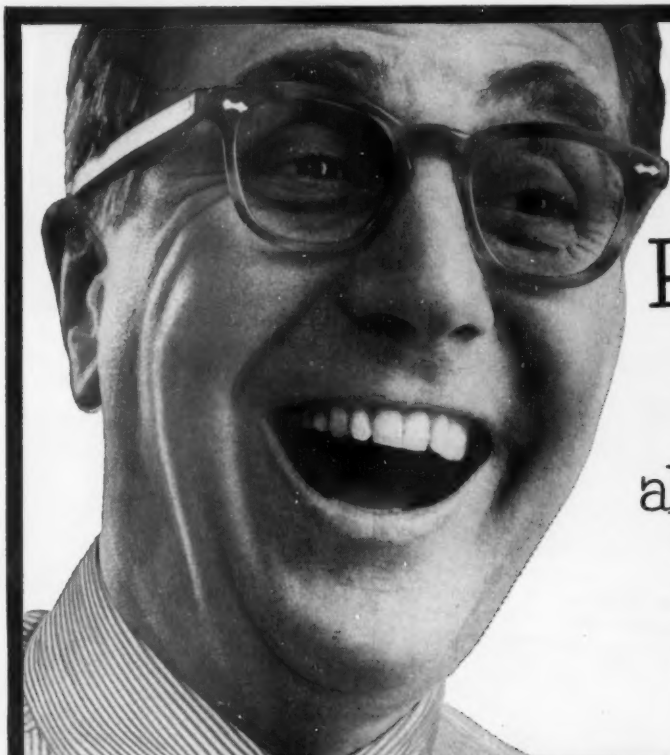
Here at last is a logical, common-sense appeal to the 80% of the homeowners in your territory whose homes need larger sized wires, more circuits and outlets ... and need them today.

It's a straightforward, educational campaign that *pre-sells* your prospects.

Tie-in with Kennecott!

This is a made-to-order opportunity for you to key your own local home wiring and re-wiring sales efforts to a hard-hitting national broadside! Promote your own interests by writing today for free advertisement reprints and poster-size blow-ups for mailings and displays.

Kennecott Copper Corporation, 161 East 42nd Street, New York 17, N. Y.



HOORAY!
Now his
TV set
always shows
full-sized
pictures!

Why couldn't it do that before?

No, there was nothing wrong with this gentleman's TV set. It just wasn't getting enough *electricity*. Because the *wires* in his house were too small... too weak... to carry a full load of current. So, when he switched on other appliances, his TV picture shrank in size!

But, he *did* something about it... had his wiring inspected, corrected. Now he gets full-powered, *full-sized* TV pictures all the time!

Put *yourself* in this man's place. Chances are your own TV set... your many other appliances, too... may not be getting the power they need

to run as well as they can. You may be paying out good money for *wasted current*. You might be *risking fire* from undersized, overloaded, overheated wires!

At least, these things are happening today to over 80% of all American homeowners!

So, if you suffer from appliance troubles... if your lights often flicker and dim... if fuses keep blowing out or circuit breakers keep tripping... if you don't have enough outlets where they are needed... then *look to your wiring!* Talk it over with your electrician!

Published for your information by

Kennecott
COPPER CORPORATION

Fabricating Subsidiaries: CHASE BRASS & COPPER CO. KENNECOTT WIRE & CABLE CO.

LOOK TO YOUR ELECTRICITY!

If you own a house, see your electrician. He will gladly make a study of your wiring system, tell you what work if any may be needed, and its cost.

If you plan to buy a house, be sure to plan your wiring for the future as well as the present. Remember that, on the average, your electrical needs increase 10% every year!

If you are going to build, be sure to plan your wiring for the future as well as the present. Remember that, on the average, your electrical needs increase 10% every year!

Kennecott Copper Corporation
161 E. 42nd St., New York 17, N. Y.

This advertisement, appearing in SATURDAY EVENING POST and THIS WEEK, will reach more than fifteen million readers. It is only one of a regular series of Kennecott advertisements aimed at educating the public to the importance of adequate home wiring.



BULLDOG ALUMINUM BUStrIbution[®] DUCT

helps North American build Super-Sabres



North American
F-100 Super-Sabre

To keep their famous Super-Sabre Jets rolling smoothly off the line, North American Aircraft needed a dependable, flexible power distribution system. That's why, in two installations alone, they installed more than half-a-mile of Bulldog Aluminum BUStrIbution Duct.

The high bay construction, and the obstacles presented by girders and pipes in the North American plant, were a natural for the use of lightweight aluminum bus duct. The weight saving in each 10' duct section greatly eased the strain of the extra handling required in the installation job. Less dead weight on building superstructures, too.



1600-amp. LO-X BUStrIbution serves as main feeder to welding department to minimize voltage drop during welds.



600-amp. Plug-In BUStrIbution, with tap-off provisions each 10', provides 100% coverage of production area with 50-foot runs.

These savings in installation costs — in addition to lower first cost — are prime reasons for the widespread use of Bulldog Aluminum Conductors in plants throughout the country.

Aluminum BUStrIbution Duct features in its design the same quality and dependability that have gained Bulldog world-wide reputation as a pioneer of bus bar distribution systems. It is completely interchangeable with other Bulldog BUStrIbution systems and is listed by Underwriters' Laboratories, Inc. For complete information, consult your local Bulldog Field Engineer. Or, write: Bulldog Electric Products Company, Dept. EC-64, Detroit 32, Michigan. ©BEPCO



Export Division:
13 E. 40th Street
New York 16, New York

In Canada:
Bulldog Electric Products Company (Canada) Ltd.
80 Clayson Road, Toronto 15, Ontario

BULLDOG

ELECTRIC PRODUCTS COMPANY

Practical Methods

Spring-Operated Lift Seats Ceiling Troffers

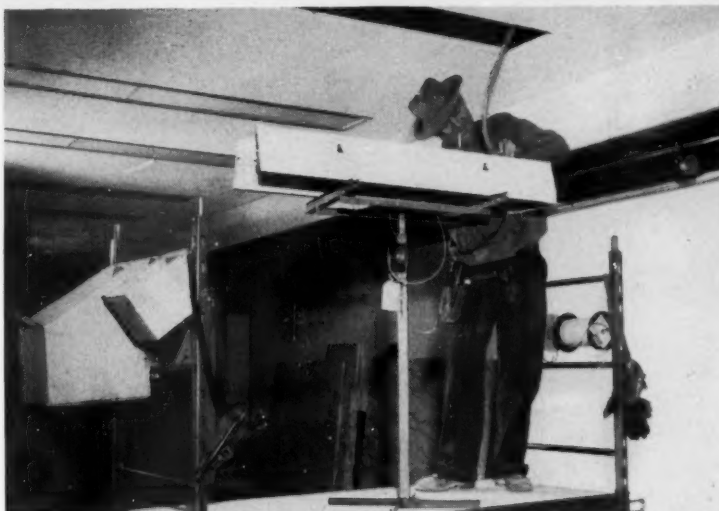
INSTALLATION

A spring-actuated lift is cutting a substantial number of man-hours off the time required to install thousands of fluorescent troffers in Detroit's new City-County building now under construction. Designed and built by engineers of Harlan Electric Company, project electrical contractor, the unique "rig" (as it is called by the electricians) permits one man to do the work of two on a rolling scaffold. Since the unit supports, lifts and holds the fixture in position, the mechanic has both hands free to make circuit connections and mount the troffer to its supporting brackets.

The lift, which employs the spring-balancer principle, is simple in design and construction. Basic components consist of a fixture rack; a square, hollow steel plunger; a square, hollow steel post of larger cross-section with angle-iron base brackets; two spring-balancer units (flat ribbon steel wound on spring-retention shaft or drum in metal enclosure) and a locking pin.

Two 24-inch lengths of angle-iron with 20-inch long wood end-pieces comprise the rack which holds the fixtures. The end pieces are faced with $\frac{1}{2}$ -sections of rubber hose or sponge rubber to provide a positive grip on the fixture and prevent marring. This rack swivels 360-degrees on the steel plunger which telescopes into the hollow steel post. Lengths of angle-iron welded to the four sides of the post form an X-base which holds the post upright on the scaffold platform. Both post and plunger extend below scaffold level through an opening in the platform. Two spring balancer units are mounted diametrically opposite each other near the top of the supporting post. Their steel ribbons thread down through the small clearance between the telescoping plunger and the inside of the hollow post; are welded to the bottom of the plunger.

Operation of the unit is as simple as its design. When the rack is in the "down" position, it rests a few inches above the top of the supporting post and is locked in place by a lever-and-spring-controlled pin which protrudes through both post and plunger. In this position, the plunger extends below the end of the post, and the two steel ribbons are unwound against the spring tension in the balancer units. There is a constant force tending to



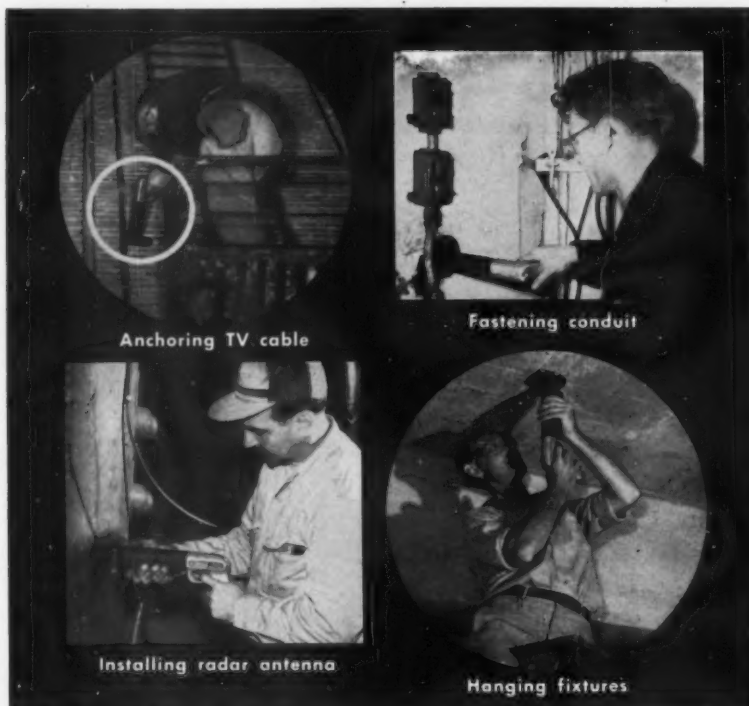
TROFFER RESTS ON LIFT locked in "down" position while mechanic completes connection to flexible conduit jumper from outlet in suspended ceiling. When locking pin is released . . .



LIFT RAISES FIXTURE as mechanic on rolling scaffold guides troffer into ceiling opening. Cross-pieces on rack are faced with rubber to provide positive grip and prevent marring. Rack swivels 360 degrees. When unit is positioned . . .



RACK HOLDS TROFFER firmly against suspended ceiling. Spring-actuated lift supports all weight giving electrician freedom of both hands to mount unit to supporting bracket bolts. Lift has a 54-inch vertical range.



More contractors use **Ramset**
THE FASTENING SYSTEM
 than all other makes combined . . .
 because of utility, speed and economy

Contractors using high-speed RAMSET SYSTEM for fastening into steel and concrete find that it "pays off" in at least three ways. That's because RAMSET:

1. Increases profits by reducing costs.
2. Enables lower figuring on competitive work.
3. Saves money for its users.

The advantages of RAMSET SYSTEM are so superior that in a nationwide check of users of powder-actuated tools, 57% of contractors prefer RAMSET over all other makes combined. They like RAMSET because of:

Tools matched to the work—three sizes of RAMSET JOBMASTER Tools

offer widest utility for light, medium or heavy work.

Widest range of fasteners—permitting fasteners to be closely matched to the job.

Balanced power charges—varied in strength to suit materials, tools and fasteners.

Finest field service—prompt, competent, on-your-job suggestions for fastest, easiest, lowest cost methods.

You can be sure of maximum economy and time saving by using RAMSET SYSTEM for fastening into steel and concrete. See your RAMSET dealer for demonstration or write us for details.

Ramset Fasteners, Inc.

Ramset Division, Olin Industries, Inc.
 12105 BEREA ROAD • CLEVELAND 11, OHIO

FIRST IN POWDER ACTUATED FASTENING



pull the plunger upward.

After the troffer is placed on the rack and the circuit connections made to the flexible conduit jumpers, this upward force is released by disengaging the locking pin. As the steel ribbons rewind in the spring-balancer housings, they raise the plunger (and rack) upward. During this phase of the operation, the mechanic guides the troffer into the suspended ceiling opening and lines up the mounting holes with the bracket bolts. Once the troffer is in position, the rack holds it securely against the ceiling and the mechanic has both hands free to fasten the unit. He has no weight to support with arms or shoulders.

Normal procedure is to have one mechanic using the lift on the scaffold; a second mechanic hands him the troffer body, ballast and socket assembly, lamps, and diffusing glass enclosures in that sequence. The "ground" man also maneuvers the rolling scaffold into position as the fixture installation progresses. Members of the "fixture crew" prepare the component assemblies in the interim.

Both Harlan engineers and mechanics are more than pleased with the results obtained. One mechanic who has "been around" in the electrical construction field commented that this was the slickest "rig" he had ever seen.

Anti-Vibration Motor Mounts

INSTALLATION

Simple, shop-made circular rubber heels provide efficient anti-vibration motor mounting in an application reported by Clifford T. Bower, London, England. In this installation, the rubber heels are used to reduce vibration of a motor mounted on a sensitive drill press. Previously, motor vibration was transmitted through the frame and legs of the drill press to the light wooden floor in the shop. An annoying hum was set up, and the floor and windows vibrated with the motor noise. Rather than replace the motor, which was fairly old but in good condition, the anti-vibration mounts were developed.

As shown in the photo and diagram, the rubber heels are so arranged that there is no metallic link between the motor feet and the drill press. Each rubber heel has a recess in one side to accommodate a star-shaped metal washer and the head of a stove or carriage bolt. When the heels are placed recess-to-recess, as shown in the diagram, the bolt heads have space between them, effectively isolating one from the other.



PAPER PULP and water can't get at wiring protected by Sealtite Electrical Wiring Conduit.

Sealtite Flexible Conduit shrugs off daily dose of water, paper pulp, oil and chemicals

The Sealtite* Electrical Wiring Conduit shown above is hooked up to motors which drive machines used to make paper. It's as rough a service for wiring conduit as you'll find. Air is hot and steamy. Floors are wet. Oil, chlorine, caustic soda and wet pulp come in daily doses.

Ordinary conduits fail rapidly under such attack. But Sealtite's tough synthetic cover shrugs it off. Wiring can't be damaged. It's protected against foul-up and corrosion.

Sealtite is light and flexible. It installs easily in cramped spaces. It absorbs vibration—takes movement. It hugs motor contours . . . looks neat.

Sealtite Type U. A. is the first conduit of its type to be approved by Underwriters' Laboratories, Inc. for use where exposed to moisture and mineral oils (see N. E. Code, Art 351). For tight bends on machine tools and industrial equipment, use Sealtite Type E. F.† (Extra Flexible). It meets standards set by J. I. C.

Electrical wholesalers stock both

types in coils. Buy it this way; then cut without waste. Wholesalers also stock standard liquid-tight connectors for use with Sealtite.

†Pat. Applied For *Trademark

SEALTITE

flexible, liquid-tight electrical conduit
an ANACONDA® product

**The American Brass Co., American Metal Hose Branch,
Waterbury 20, Conn.**

Please send me descriptive booklets on Sealtite Electrical Wiring Conduit.

NAME.....

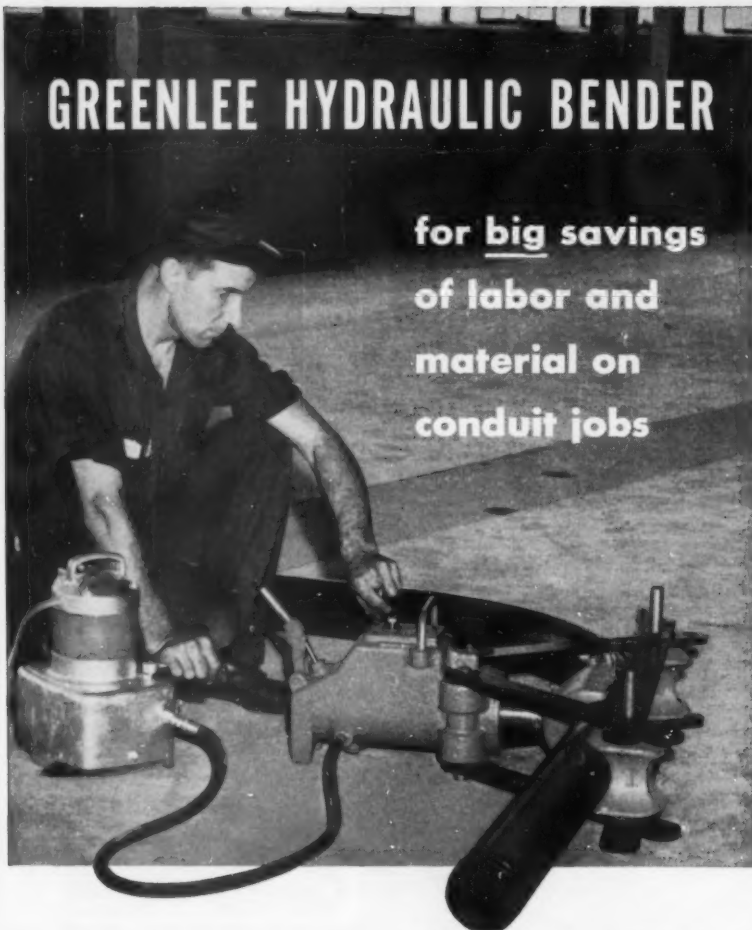
COMPANY..... PLEASE PRINT

STREET.....

CITY..... ZONE..... STATE.....

GREENLEE HYDRAULIC BENDER

for big savings
of labor and
material on
conduit jobs



extra fast, easy operation with portable power pump

Here's the combination that's making many a conduit installation job move along far faster today — a portable GREENLEE Hydraulic Conduit Bender *plus* a handy power pump.

Neat, tailor-made bends result every time with a GREENLEE Bender. Owners report remarkable labor savings — ranging from 50% to 90%. And the cost of many manufactured bends and fittings is entirely eliminated.

With the GREENLEE, *one man* in but a few minutes makes smooth, accurate bends in pipe up to 5", rigid and thin-wall conduit, tubing, bus bars. Compact, portable — for *on-the-job* bending exactly where and when wanted. Often pays for itself on the very first job. Two models. Portable power pump, built especially

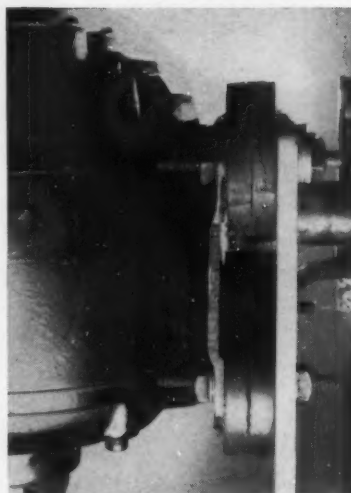
for GREENLEE Benders, lets you put your bending on a fast, "production line" basis. Has built-in 1/2-H.P., 110-volt single-phase electric motor with sealed, permanently lubricated bearings. Delivers intermittent pressure up to 9,000-10,000 lbs., continuous pressure of 5,000 lbs. Easy to move with Bender from job to job.

Let this highly efficient, powerful bending equipment help you speed work, save materials, get better overall results on your next conduit job. Write for details. Greenlee Tool Co., 1747 Columbia Avenue, Rockford, Illinois.

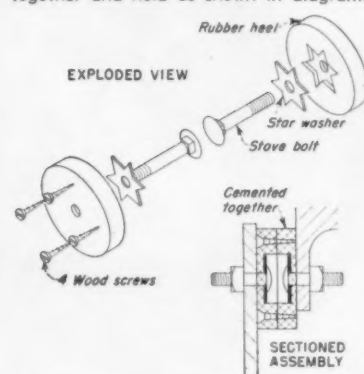


OTHER GREENLEE TIMESAVING TOOLS FOR ELECTRICAL WORK

Hand Benders • Knockout Tools • Auger Bits and Drills • Cable Pullers • And Many More



ANTI-VIBRATION MOUNTS completely insulate motor mechanically from drill press frame; consist of rubber heels glued together and held as shown in diagram.



CONSTRUCTION DIAGRAM of one mount shows complete assembly.

The bolts used are 1/2-inch in diameter, and the square under the head is arranged to lock against turning in the star-shaped metal washer by drilling out the existing hole in the washer to 3/8" diameter and then driving in the squared part so that the bolt cuts notches in the washers.

Although strong rubber cement was used to hold the faces of the rubber heels together, four ordinary wood screws were also used, as shown, to supplement the hold of the cement and provide additional mechanical fastening. These screws hold very well and can be inserted easily if a starting hole about 1/8-inch in diameter is pre-drilled. The wood screws should be as short as possible.

With the arrangement shown, the rubber is in a state of shear. These mountings could also work well in compression if the distance between the bolt heads was increased by adding a third rubber heel to each mounting. There must be no possibility of the bolt heads making metallic contact.

Westinghouse
Distributor Report



Here's how I can help you convince management

Put yourself in management's shoes for a minute. For certain, you'd be taking a look—a *long* one—at practical ways to make your products better, faster, cheaper. Competition has forced just such a look.

And that's where I—and Westinghouse Distributors like me—can help you convince plant management.

We'll show you how our products and headquarters engineering services mean better plant efficiency, fewer outages, less maintenance—tangible benefits that make sense to the men upstairs.

PROOF?

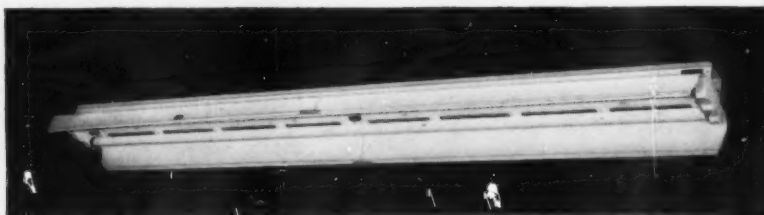
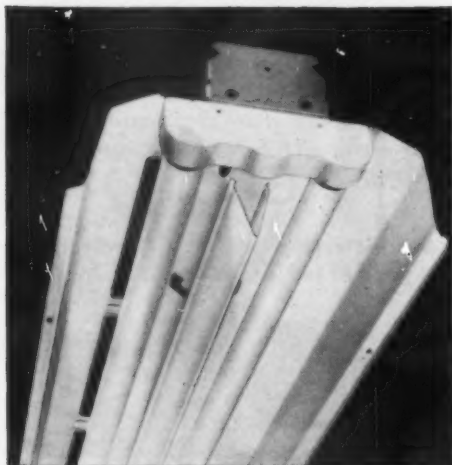
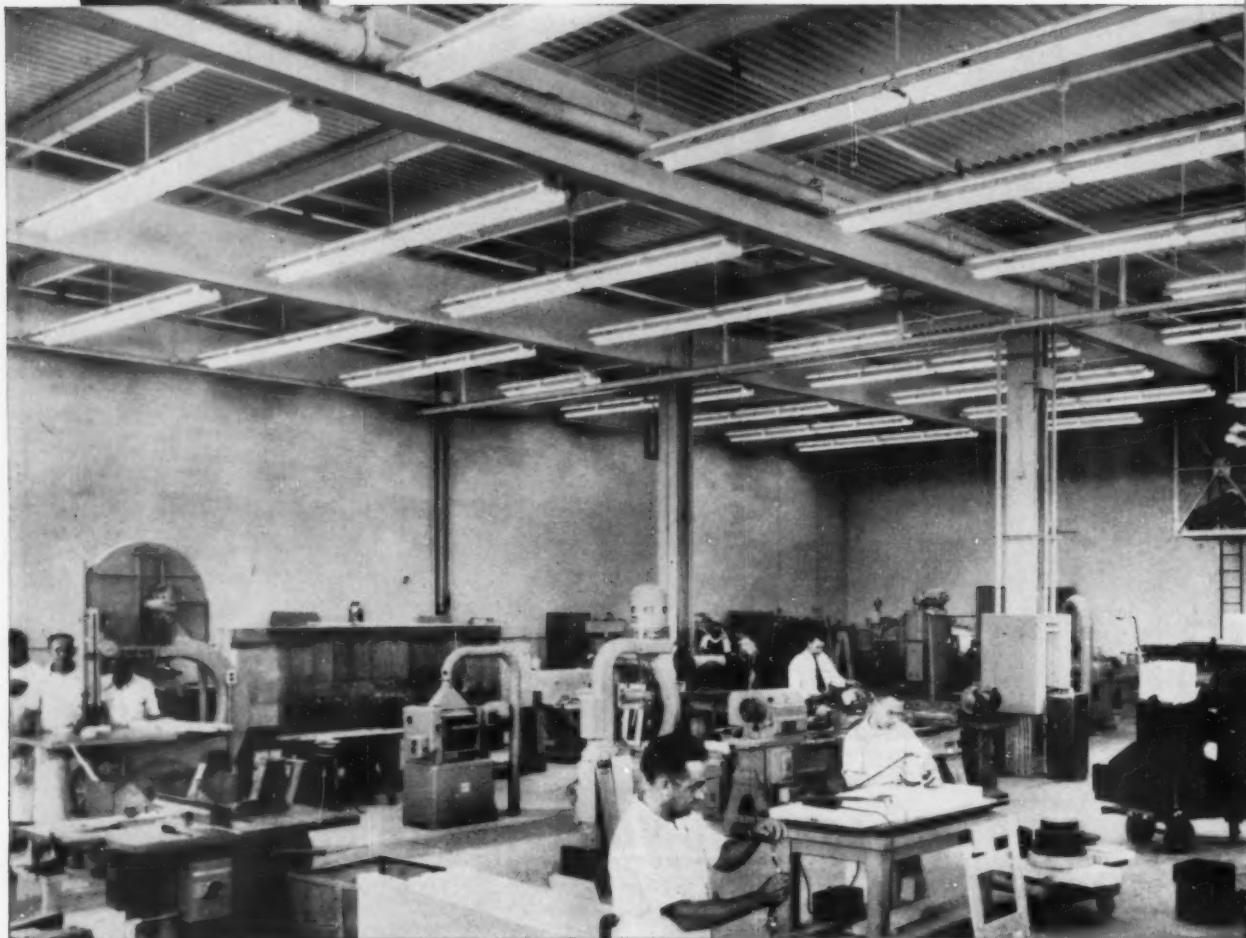
Check the next seven pages for specific examples of how Westinghouse products and services help you sell yourself to management... DP-5004-A

YOU CAN BE SURE...IF IT'S
Westinghouse





A common sense recommendation for improved production: upward component lighting. The better the light, the better people can work.



Westinghouse upward component fixture means this to plant management: Better efficiency in those areas where effortless, accurate vision is essential. Fixtures stay clean longer . . . operate cooler due to air circulating through apertures in reflector. Less maintenance is required. Available in slotted and non-slotted styles.

These construction features simplify job for installers and maintainers. One-piece channel is lightweight, easy to handle. Large, easy-to-grip wing locks hold reflector in place . . . no loose parts, no tools needed for installation or removal of reflector. Steel-enclosed lamp holder eliminates breakage. Starter socket is positively identified.

DP-5004-B

New Westinghouse SDP Luminaires step up work quality and safety

Semidirect lighting was recommended for this plant's new wing where high production depends materially on critical seeing.

2200 Westinghouse SDP's were installed, making possible more comfortable lighting at higher illumination levels. Their 22% upward component of lighting makes the light-colored ceiling a part of the lighting system.

Result: Shadows and uncomfortable brightness disappear. Better working conditions and safety are assured.

Whether it's for modernization or new construction, Westinghouse has a wide variety of luminaires to answer industrial lighting problems.

Your Westinghouse Distributor has the facts.

Use dry-type transformers to supply plant lighting from high-voltage distribution

Westinghouse Dry-Type Transformers enable you to serve your lighting loads from a high voltage power distribution system . . . economically.

That means you can serve both power and lighting loads with economical high-voltage distribution—reducing it to utilization levels close to the center of the load.

The benefits are immediate. There's less copper to buy. Excessive line losses resulting from long low voltage runs are eliminated, and better voltage regulation is assured.

The small, lightweight dry-type transformers are easy to mount—can be installed on walls, posts or overhead platforms. No vaults or protective barriers.

DP-5004-C

Type E, totally-enclosed dry-type transformer is ideal where dirt, lint and nonexplosive dust are a problem. Small and lightweight; can be installed anywhere. Maintenance practically eliminated. Periodic blowout unnecessary.



YOU CAN BE **SURE**...IF IT'S **Westinghouse** 

Westinghouse Distribution Panelboards feature screw driver convertibility



Here's a product flexibility story that spells out this benefit to management: quick production change-overs.

Westinghouse Convertible Distribution Panelboards have designed-in flexibility to easily accommodate the change-overs modern industry is continually making in its production lines.

Circuit rearrangement—to meet load shifts or expanding power requirements—can be made quickly and economically.

Type CDP panelboard, above, is an example of how Westinghouse designs flexibility into an electrical system to meet load shifts. Its convertibility feature means that one or more breakers can be replaced with larger or smaller ones to match circuit protection specifically to a plant's changing production facilities.

And this conversion can be made with a screw driver—due to the pre-tapped busbars, back pan and other standardized parts.

DP-5004-D

Type CDP—designed for flexibility in rearranging circuits to changing load conditions. You can change over branch circuits quickly and easily with this panelboard. Buses and back pan are drilled and tapped to accommodate any breaker from 15 to 600 amperes.

More Westinghouse product benefits that help you sell better, lower cost production through modern electrical practices . . .



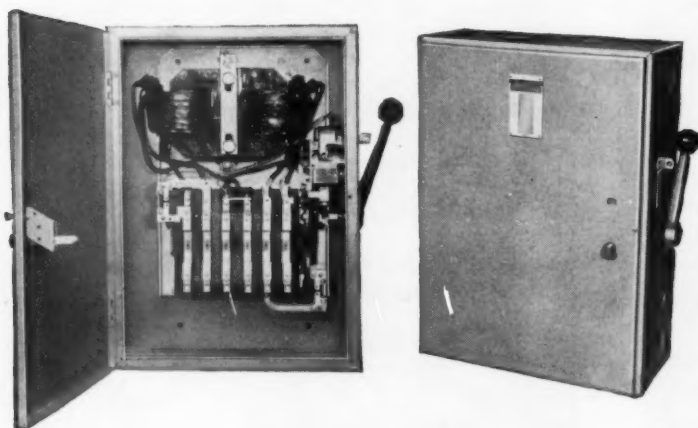
YOU CAN BE **SURE**...IF IT'S



"Package plan" speeds your AB-I installations. Enclosures and breakers are packaged separately. It's no longer necessary to remove breaker before mounting enclosure. Mount enclosure first. Make conduit and cable runs. Then, insert AB breaker and connect it in the enclosure. This cuts one installation step. Enclosures and breakers available from stock.



Sell less down time with AB-I's by checking off these circuit breaker advantages: 1. No tripping on temporary, harmless overloads. 2. Service restored speedily after heavy overload interruption. A flip of the handle does it. 3. No danger of over- or under-fusing. No fuses to stock or replace. Shown above: new NEMA XII (JIC Standards) enclosure.



New Type MB manual auto starter. Designed for application wherever across-the-line starting current of squirrel-cage induction motors is likely to exceed local power restrictions or interfere with plant operations. Keeps current inrush within limits and still gives maximum starting torque. Protects against overload or low voltage.

Consider these advantages of the new Type MB auto starter. All sizes employ double-break, silver-alloy contacts—minimizing pitting, burning, sticking. Oiling of moving parts not required. Foolproof, too, operating handle cannot be moved from start-to-run position until specific acceleration period has elapsed. Trouble-free sequence mechanism, operated by synchronous motor, does the timing.

DP-5004-E

Westinghouse





New heavy-duty enclosed switch spells added protection for operators

Complete protection for operating personnel. This is an outstanding feature of the new Westinghouse Type "H" Safety Switch—now ready for rugged, heavy-duty industrial applications.

Available in a complete range (up to 1200 amps and 600 volts), it provides an interlocked cover that cannot be opened when the switch is in the "ON" position. And a Micarta® shield is located over the line terminals. Thus, exposure to the live parts is minimized during inspections or fuse replacement.

Further, this new safety switch offers these "plus" advantages:

1. Neoprene gasket and trunk-type cover latches—resulting in Nema-1A dust-resisting enclosure.
2. Operating mechanism is contained in a rugged cast handle—leaving side gutters free for wiring.
3. Copper parts are tin plated—minimizing corrosion and high resistance oxidation.
4. Westinghouse Exclusive Diamond-pointed Break Jaw and Extended Blade. Arcing occurs outside contact area—keeping parts clean.
5. Westinghouse Exclusive De-ion® Arc Quenchers—extending contact life.

The new Type "H" safety switch is part of a complete Westinghouse line—available for every industrial application.

DP-5004-F

YOU CAN BE **SURE**...IF IT'S
Westinghouse



Aluminum bus bars now available in Westinghouse Bus Duct

Westinghouse Bus Duct with aluminum bus bars is new. And highly significant is the plating process—the positive adhesion of silver to aluminum to assure low electrical resistance at bus bar connections.

This exacting process involves electroplating over zincate. It utilizes a silver-on-silver plating method. Better adhesion is obtained. Corrosive action is minimized.

If damage causes a break-through in the silver plating, the silver undercoat will not form a resistant oxide.

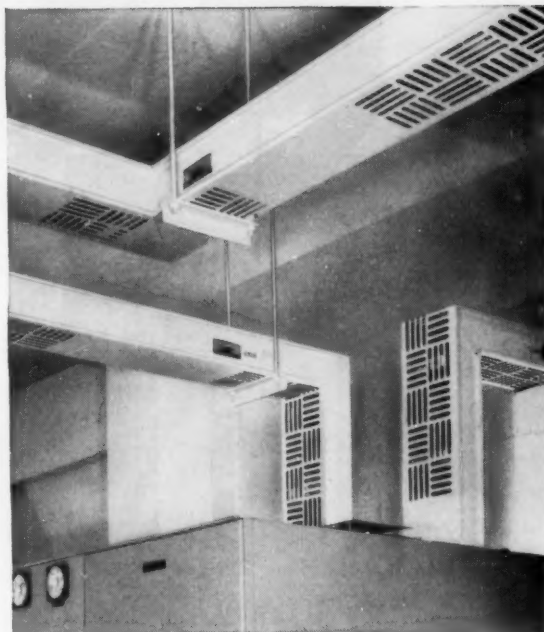
Additionally, new aluminum bus duct offers these features inherent to the complete Westinghouse Bus Duct line:

More power per dollar. Presently available through 3000 amperes, it has greater current-carrying capacity, pound for pound, than cable and conduit.

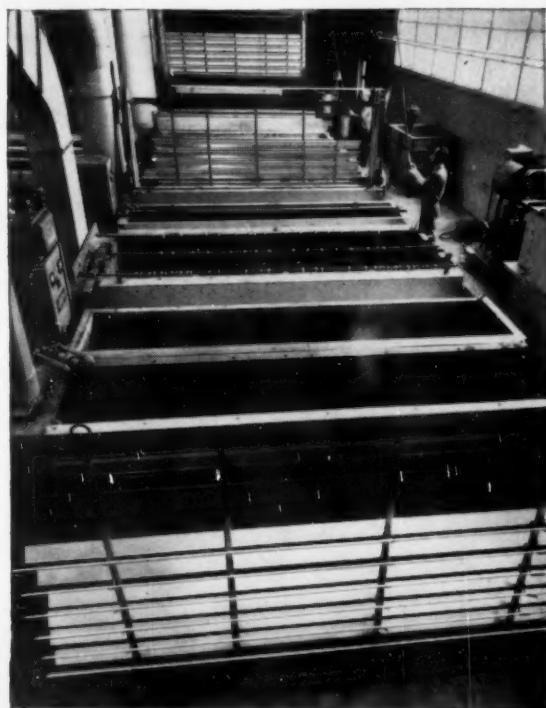
Lower installation cost. Prefabricated in sections, bus duct goes in faster than cable and conduit.

Unequaled flexibility. Installs easily in any layout around any obstruction. Can be relocated at any time.

DP-5004-G



Final assembly follows plating process that guarantees silver adhesion, thickness and uniformity on aluminum bus bars.



Silver-on-silver plating process uses selective tanks and timing controls with modern automatic and mechanized equipment.



			
LIFE-LINE "A" MOTORS	LIFE-LINE STARTERS	AB-1 CIRCUIT BREAKERS	PANELBOARDS
			
CAPACITORS	BUILDING-TYPE SWITCHBOARDS	POWER CENTERS	BUS DUCT
			
CONTROL CENTERS	INDUSTRIAL LIGHTING		DRY-TYPE TRANSFORMERS

A complete line of products from a single source

It means this: Your nearby Westinghouse Distributor is a one-call, one-stop source for your electrical apparatus requirements.

He offers complete product lines—Westinghouse Apparatus that's engineered for simplicity and features standardized design to speed your installation work.

He has full product stocks readily available from centralized warehousing facilities. This pinpoints responsibility. It assures quick delivery and helps

you make your installations in minimum time.

And through your Westinghouse Distributor you get all the engineering, product and application assistance you want. Teams of Westinghouse specialists bring these to you . . . help analyze the electrical problem . . . select, coordinate and apply equipment.

Get in touch with your Westinghouse Distributor for complete information. He is as near as your telephone.

DP-5004-H

YOU CAN BE **SURE**...IF IT'S
Westinghouse



 <p>Wiring Devices</p>	 <p>Wire and Cable</p>	 <p>All Types of Lamps</p>	 <p>Ventilating Equipment</p>
 <p>Signal Systems</p>	 <p>All Types of Tape</p>	 <p>Power Tools</p>	 <p>Electronic Tubes</p>
 <p>Water Coolers</p>	 <p>Conduit Fittings</p>		
 <p>Conduit</p>	 <p>Desk Bracket Fans</p>		

As Near As Your Phone . . . Over 18,000 Electrical Items

The chips are down. You need lamps (or tape, or power tools, or conduit). You name it.

The Wesco man at the end of your phone is waiting for your call. From one, convenient location he'll deliver the quality apparatus and supplies you need to do the job. If you're stuck with a tough problem, Wesco has specially trained people to solve it. If you're facing a seemingly unbeatable deadline, Wesco specializes in meeting target dates ahead of schedule.

All 115 Wesco Branches carry their own local stocks of apparatus and supplies—making available to you the names you know best in electrical products . . . all from ONE responsible source of supply.

Whether you're in on modernization or new construction, keep your local Wesco man in mind. Quality apparatus and supplies, delivered where you want them, when you want them, are his special cup of tea.



Westinghouse Electric Supply Co.

A NATIONAL DISTRIBUTING ORGANIZATION

115 BRANCHES SERVING CONTRACTORS AND MAINTENANCE DEPTS.

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . AUGUST, 1954

How do you
weigh the actual
cost of a motor?

PURCHASE
PRICE

REPAIR
BILLS

LATE
DELIVERIES

LOST
MAN HOURS

LOST
PRODUCTION

Keep costs down...choose Wagner® Motors

The selection of the right motor for every specific industrial application is all important. Due consideration must be given to motor type, rating, slip, torque values, and other operating characteristics.

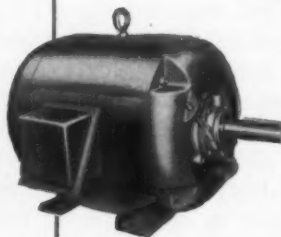
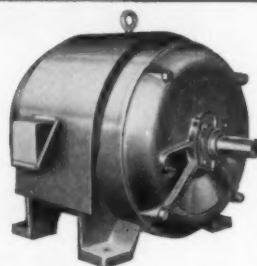
But, because the ultimate cost is the actual cost of a motor... alert buyers look beyond such specifications. They look for other factors, such as cool operation, with consequent longer insulation life... and they consider the *time-tested proven dependability* of the brand of motor they specify. They know that it's costly to take chances with motor drives.

Wagner Motors have been proving their reliability for more than sixty years. Many thousands of users throughout industry have found them a lasting investment in continuous troublefree performance.

The wide range of types and sizes in Wagner's complete line permits the selection of a standard motor for almost any need. Bulletin MU-185 gives full information.

Your nearby Wagner engineer will be glad to help you select the *right* motors for your next application. Call the nearest of our 32 branch offices, or write us.

Open type poly-
phase squirrel-cage
motor for general
purpose applications
... 1/4 to 400 hp.



Totally enclosed, fan-
cooled motor... ex-
plosion-proof or stand-
ard types... steel or
cast-iron frame... 1 to
250 hp.



WAGNER ELECTRIC CORPORATION
6413 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

ELECTRIC MOTORS
TRANSFORMERS
INDUSTRIAL BRAKES
AUTOMOTIVE
BRAKE SYSTEMS—
AIR AND HYDRAULIC

Motor Shops



Motor Test Equipment

Shop personnel at Nager Electric Co. Inc., Brooklyn, New York, have fabricated motor test equipment to accommodate motors up to 300 hp. Disconnect switches and indicating instruments are mounted on two panelboards, one furnishing 2- or 3-phase power from 150 to 600 volts ac, the other from 0 to 350 volts dc. Large motors and generators to be tested are anchored to a metal framework to the right of the panelboards; smaller equipment is set up directly on the concrete floor.

To test a motor under load, a 25-kw dc generator mounted on the wall above the test position is belted to the motor, providing a mechanical load, the generator output being absorbed by a variable resistance. Shown during a prony-brake test for determining output horsepower is a 15-hp, 1800-rpm slip-ring motor. Instruments available permit additional tests for power factor, line balancing, and generator operating characteristic curves.

Perforated Card Serves As Receipt, Work Sheet And Identification Tag

One standard card form, perforated so as to form three sections, and printed in three different colors to designate various handling and routing procedures, is a definite efficiency aid

in the shop of Queens Electric Motors, New York. The card measures approximately 4½ by-10 inches overall, with the bottom perforated inch serving as a receipt, the top perforated inch serving as a tag which is secured to the motor frame during its passage through the various repair departments, and the large center section serving as a file, work sheet and time card. Each section is numbered identically. In addition to this number, the receipt section merely carries the name, address and phone number of the repair company, and the tag section carries only the name of the customer.

All information related to the cus-

tomers, various order and invoice designations, the number of the tote-box in which the motor parts are kept while it is disassembled, capacity and characteristics of the motor, names of all persons working on the repair job (together with spaces for straight time, overtime and hourly rates), a listing of materials and parts used, the estimated cost, actual cost and final billing (cost plus overhead and profit), are listed on the center section.

Upon completion of the repairs, the customer is notified by phone to pick up his motor and, when he or a representative actually does this, he is presented with the invoice which he signs to verify delivery.

After the motor has left the shop, the above-mentioned work-cards are filed numerically for an 18-month period so that, in the event of a come-back, the shop will have a full record of what was done and by whom.

Cards printed in black indicate that normal repair procedures are to be used and that the motor is to be returned to the customer upon completion. Cards printed in green indicate that the motor is to be repaired, then placed in stock to serve as a future replacement or exchange unit. Cards printed in red show that the motor is a come-back job and therefore should be checked to see whether the former job was performed within the period of the guarantee, whether the original job was for the same scope of cause, and to check, if possible, the reason for the repeated trouble.

Over a period of many years, the percentage of come-back jobs in the Queens shop has averaged less than 2½%, but subsequent checking proved that many motors in this group failed due to improper operation, overloads, improper application, corrosive or abrasive atmospheres in the motor-mounting area, and the like. Of all jobs, therefore, the group of authentic and unaccounted-for complaints has been less than 1%.

No. 6080	
QUEENS ELECTRIC MOTORS, Inc.	
Name _____	
No. 6080 Order No. _____	
Rep. No. _____	Inv. No. _____
Name _____	
Tel. or _____	
Address _____	
In _____	From _____ Out _____
Make _____ Frame _____	
H. P. _____	Model _____ V. _____
R. P. M. _____	Type _____ A. _____
Phase _____	Sec. No. _____
Fin. _____	Pulley _____ Base _____ Coupl. _____
J-Bar _____	Roll-By _____ Other _____
Ret. Switch _____	Ret. Switch _____
Remarks _____	
Price _____	
REPAIR _____	
REWIND _____	
MATERIAL _____	
OTHER _____	
TOTAL PRICE _____	
QUEENS ELECTRIC MOTORS, Inc.	
94-12 130th Street	
Jamaica 2, N. Y.	
Phone MAmain 6-7196	
No. 6080	

CARD IS PERFORATED so that it may easily be torn into three separate sections, with the bottom section going to the customer as a receipt for his motor, the top section being fastened to the motor frame during the repair cycle, and the large center section serving as a work sheet and file card for reference purposes. Motor characteristics and final billing is listed on the front; time cards, materials and parts on the rear. Cards are printed in black, green or red to indicate routine procedures, routing to stock shelves or come-back investigation.

Chart Gives Ohm's Law With Variations

The accompanying diagram is not a dart board, but is a rapid-reference W-I-R-E chart; the W standing for watts, the I for amps, the R for ohms of resistance and the E for volts, with all formulae based on Ohm's Law.

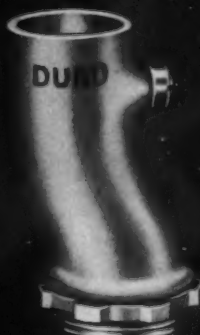
NOW!



E.M.T. OFFSET
INDENTOR CONNECTOR

*for the first time
...anywhere!*

Steel Offset Fittings



E.M.T. OFFSET
SET SCREW CONNECTOR

by

DURO



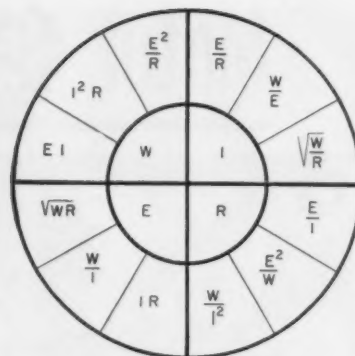
E.M.T. OFFSET COMPRES-
SION TYPE CONNECTOR

*eliminates bending
saves time and money
simplifies installations*

The Fastest Growing Name in Fittings

DURO FITTINGS COMPANY

(MULTI PRODUCTS MANUFACTURING CO.)
2040 SANTA FE AVENUE
LOS ANGELES 21, CALIFORNIA



USING THE BASIC LAWS OF $E=IR$ and $W=EI$, this useful reference chart was developed as a quick reminder to shop or office workers who are occasionally interested in checking wattage, current, resistance or voltage.

This interesting wall chart records some useful information in a simple form and, as here presented, shows that wattage, for example, is the product of volts and amps, amperage squared multiplied by resistance, or voltage squared divided by ohms. In like manner, other basic formulae pertaining to the other letters, I-R-E, are grouped around the edge of this circular arrangement in their proper order.

Automatic Dispenser Assures Clean Lubricant

Clean grease or lubricant, free of dirt, grit or fine metal filings, is a must for electric motor bearings. The presence of foreign matter in lubricants will cause a grinding action when the motor is in operation and result in bearing failure and possible damage to rotor and stator. Application of such lubricants with a finger, stick or spatula invites accidental contamination of the grease either during application to the bearing or storage in an open container.

Motor repair shop operators take various precautions to make certain that their bearing lubricants are kept "clean" at all times. Miller-Seldon Electric Company in Detroit uses a pneumatically-operated, automatic grease dispenser. The unit holds a standard 50-pound can of grease; is mounted on a light hand truck so it can be moved to any part of the shop and plugged into a nearby compressed air line.

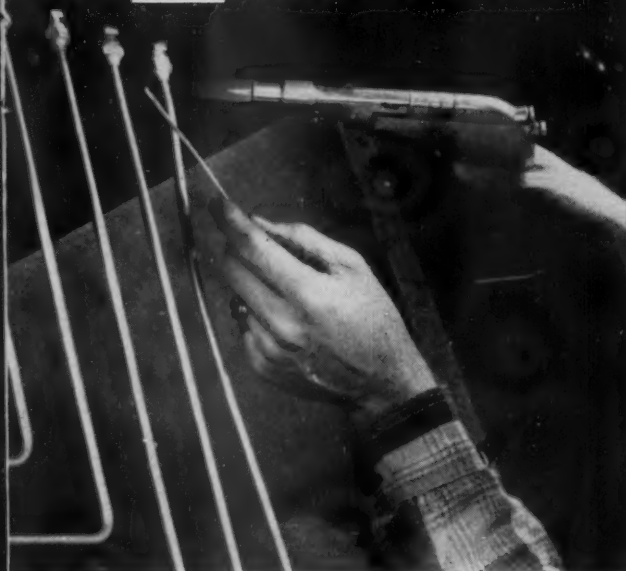
"Loading" the dispenser is a simple operation. The lid is removed from a new can of grease and the can is lowered into the dispenser tub. The cover, with its pneumatic mechanism, is then placed over the top of the con-

**USE
PROPANE?**

**USE
ACETYLENE?**

USE THIS TORCH-O-MATIC

USE THIS TORCH-O-MATIC



**Whichever Torch-o-matic you use — exclusive
Trigger-control saves you time, saves you fuel**

With either the Propane or Acetylene Torch-o-matic, you get the *exclusive trigger-control* feature that saves time, saves gas, adds safety to every job.

Here's how Torch-o-matic Trigger-control works for you. The instant you pull the trigger, the flame lights, and you're ready to go to work. No matches, no adjusting, no time wasted. Release the trigger and the flame shuts off. You don't have to wait for the line to clear before you move safely to another location. And when you're ready to work again, a pull of the trigger puts you in business. With the Propane Torch-o-matic, a special two-stage valve lets you increase the length of the flame from a pinpoint to a full 6 inches simply by pulling the trigger completely back. In other words, you control the flame length to suit the job requirement.

Add up all these advantages and you can quickly see how this AUTOMATIC ON-OFF trigger-control puts you way ahead when you're using Torch-o-matic, by saving gas and making every job easier and faster. And remember the safety advantage—because the Torch-o-matic shuts off automatically when the trigger is released, there is no danger of open-flame hazards to personnel or property. Too, the elimination of matches prevents another potential fire hazard.

Get the facts now on either or both Torch-o-matics, and start savings on time and fuel. The Acetylene Torch-o-matic fits your present equipment, and features a wide selection of nozzles for every job. The Propane Torch-o-matic connects directly to your propane tank—no intermediate valve fittings are necessary.

VELOCITY POWER TOOL CO.

201 N. Braddock Ave.
Pittsburgh 8, Pa.

MOST TROUBLE-FREE PROTECTION YOU COULD INSTALL!

**Pierce
Fuses Operate
10 to 40% Cooler!**

Unique screened venting permits air to circulate freely through Pierce Fuses. This allows free escape of excess heat — prevents rapid charring and deterioration of the fuse case, as in ordinary fuse construction.

**Pierce
Fuse Cases
Last 6 to 8
Times Longer!**

Yes, this venting actually makes Pierce Fuse cases last 6 to 8 times longer! No wonder these time-proved, renewable fuses are so popular!

**No
Unnecessary
Blows!**

Pierce Screened venting and balanced lag links prevent wasted links during safe overloads.

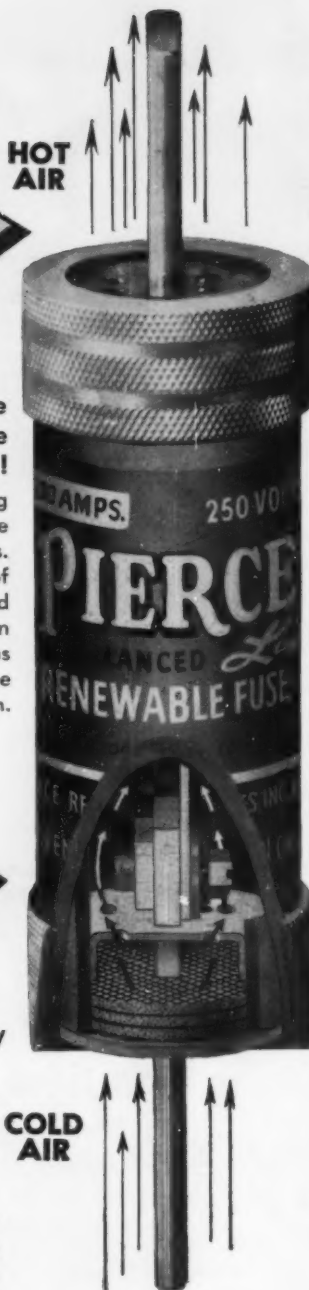
No More Danger of Afterblows

Since dangerous gases and heat have free escape, Pierce Fuses are your insurance against afterblows.



(Also a complete line of quality non-renewable fuses.)

WRITE TODAY for this factual bulletin.
Start now to enjoy Pierce benefits.



AUTOMATIC GREASE DISPENSER uses compressed air to shoot clean grease through hand nozzle to ball bearings on motor shaft. Unit, mounted on light hand truck, can be moved anywhere in the shop.



DISPENSER HOLDS standard 50-pound can of bearing grease; has top, with pneumatic pumping mechanism, which clamps securely in place to keep lubricant free from outside contaminants.

tainer and clamped securely in place to effectively protect the grease from outside contamination. Only when the trigger on the grease gun is pressed, does the compressed air force grease from the dispenser through a connecting hose to the gun nozzle. The mechanic points the gun nozzle at the bearing and does not come in contact with the lubricant during the greasing operation.

Miller-Seldon management lists these composite advantages of the automatic dispenser: clean grease, man-hour economy, less lubricant waste and ultimate customer satisfaction.

The use of this automatic dispenser now assures that all motors passing through the shop will be lubricated with the cleanest possible grease.

PIERCE RENEWABLE FUSES, INC.
LEICESTER NEW YORK



NEW! HOME FIRE ALARM

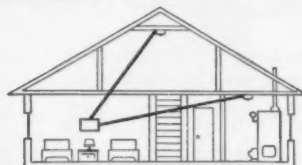
by EDWARDS

Few new homes offer *fire protection*—yet every buyer wants it! Now, with the new Edwards Home Fire Alarm, you can offer home owners and builders this powerful selling advantage as a permanent, built-in feature of new homes! It's the first and only *compact* home fire alarm system . . . with transformer, bell, test button, smartly styled in *one unit*! Easy to install—demonstrate—sell! Made and guaranteed by Edwards, world leader in fire alarm equipment for schools, hospitals, industry . . . since 1872.

NOW! OFFER FREEDOM FROM FEAR OF FIRE AS A PLUS SELLING POINT FOR BUILDERS!

Strike a match . . .
help close a sale!

Here's a simple demonstration that rings the bell with home builders—home buyers! Light a match. Hold it under a detector. In seconds, the alarm bell sounds off! Dramatic proof that Edwards Home Fire Alarm offers protection—permanent, automatic—against fire. Sell it as a \$20 feature that helps sell a \$10,000 home!



One complete, well engineered unit! Alarm bell, transformer, test button are mounted and wired together on sub-plate for mounting in standard 3-gang sectional gem box. Detector circuit only requires low-cost, easily installed bell wire. No maintenance, no servicing.



How it works. Two self-contained, automatic, foolproof detectors operate at 140°F.—ceiling-installed in furnace room, storage area, any "hazard" location. UL listed. Additional detectors available, easily added to system. Decorative aluminum plate covers equipment, fits flush into wall.

Edwards Home Fire Alarm. Catalog No. F-100. Two detectors, self-contained signal unit. List \$19.95. Mail coupon for illustrated literature.

EDWARDS Company Inc.
NORWALK, CONNECTICUT

EDWARDS COMPANY, INC., DEPT. ECM-8
NORWALK, CONNECTICUT

Gentlemen: Please send me full information about the Edwards Home Fire Alarm.

Name _____
Firm Name _____
Address _____
City _____ Zone _____ State _____

because they're Tailored to the Tube



CERTIFIED  **BALLASTS**

give you better fluorescent performance!

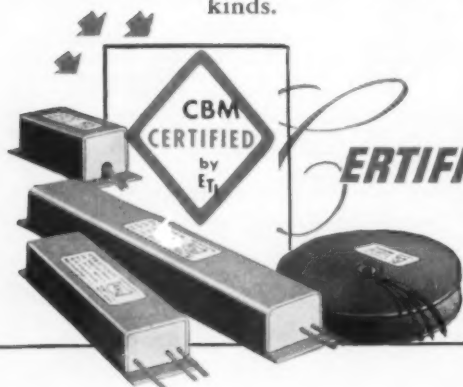
You'll get best fluorescent lighting performance from **CERTIFIED CBM BALLASTS** because they are made to match accurately the requirements of the tube they operate.

The exacting specifications designated by the Certified Ballast Manufacturers govern their production, and the ballasts are then tested, checked and certified by ETL . . . So they are truly "Tailored to the Tube".

You'll enjoy customer satisfaction and avoid complaints, for **CERTIFIED CBM BALLASTS** assure:

- LONG LAMP LIFE**
- LONG BALLAST LIFE**
- FREEDOM FROM OVERHEATING**
- QUIET, TROUBLE-FREE OPERATION**

Customer satisfaction is the reason why today more **CERTIFIED CBM BALLASTS** are being used in general lighting service than all other kinds.



CERTIFIED BALLAST MANUFACTURERS

Makers of Certified Ballasts for Fluorescent Lighting
2116 KEITH BLDG., CLEVELAND 15, OHIO

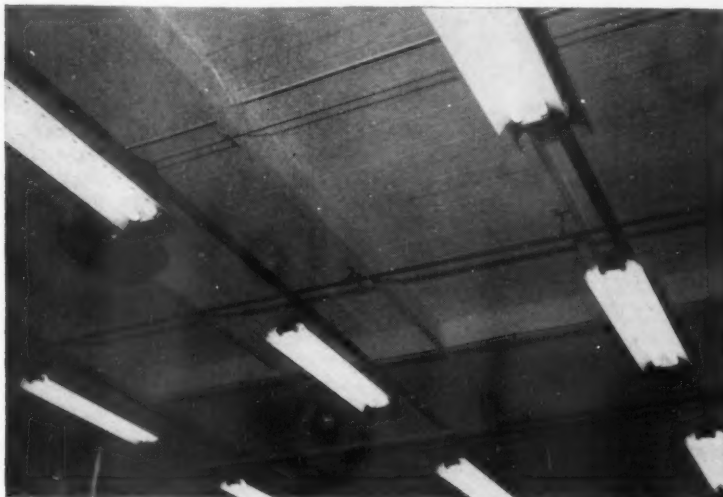
Modern Lighting

Holes in Reflectors Cut Fixture Cleaning Costs

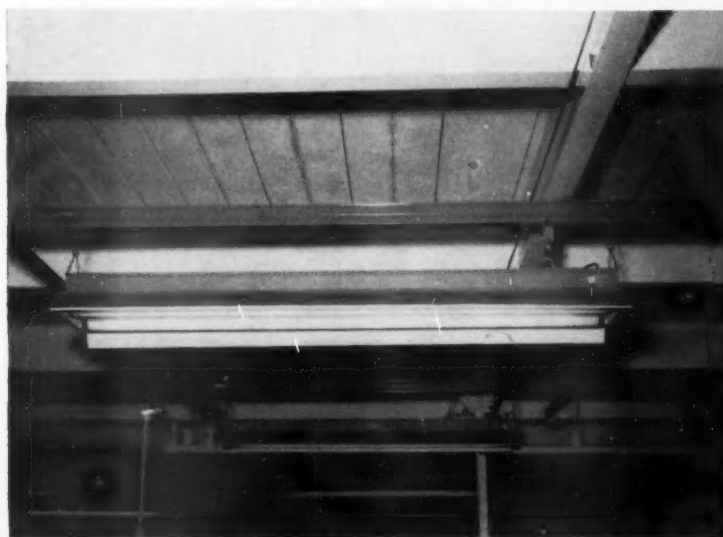
The "chimney effect" of vents in the industrial fluorescent reflectors helps maintain the 75-footcandle general lighting intensity in the final assembly department of the Detroit Transmission Division, General Motors Corp., at the Willow Run plant. Oil mist deposits on reflectors due to circulating air currents in the controlled-tempera-

ture room are reduced and time between fixture cleaning is extended some 40% longer than previously.

Lighting in the 600-ft. by 300-ft. room is provided by rows of fluorescent fixtures (two 100-watt lamps per unit) chain suspended from lines of trolley duct. Fixtures are installed on 8-foot spacing on the 16-foot ceiling.



CLEANER REFLECTORS on these fluorescent fixtures at Detroit Transmission Division, General Motors Corp., final assembly room are attributed to "chimney effect" of vents at top of reflector. Reduction of oil mist deposit helps maintain lighting intensity and cuts frequency of cleaning.



TROLLEY DUCT suspension of units gives flexibility to fixture pattern; permits quick addition of units to increase intensity when desired.



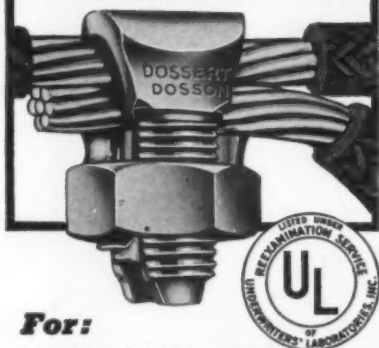
Church Floodlighting Is Highly Effective

Floodlighting has revealed the beauty of the Hill Baptist Church in Augusta, Ga., and made it visible at night from a distance of several blocks. The installation was completed in December 1953, just prior to the Christmas season, and in time to be used effectively during this period.

This lighting installation exemplifies the excellent results that can be achieved so inexpensively, simply by following sound lighting principles and good lighting practice. There are two offsets in the building, one on either side. Also, the steeple was to be lighted, and its center was back a few feet from the face of the building. For these reasons, and because of the location of walkways, etc., it was apparent to Walter S. Smith, lighting engineer for the Georgia Power Company in Augusta, who planned this lighting, that the logical solution was to use two high poles and mount adjustable floodlights atop each.

It was decided to use inexpensive 150-watt PAR reflector spot and flood lamps, to provide maximum adjustment of light beams and patterns, so as to light the entire front of the building uniformly. Calculations indicated that ten lamps, five atop each pole, would provide adequate flexibility and adjustment. Also, because of the lack of other buildings and lighted areas in this vicinity, it was decided that 1500 watts would prove effective in highlighting the church building against a dark background.

NEW! DOSSON "F" SPLIT BOLT CONNECTOR



For:

taps, dead-ends, service entrances, motor leads, junction boxes, ground wire-to-neutral connections

Fabricated from high strength alloys, all component parts of the new Dosson "F" Connector are cold formed, insuring consistent uniformity and high quality. Can be used economically over and over again!

Why It's Your Best Bet:

- high clamping pressure insures tight contact
- maximum tightening force: high translation of tightening torque
- connector alloys possess greater physical properties than average steels
- longer bearing pressure bars avoid conductor crushing, load concentration
- smooth edges can't cut lineman's gloves, nick conductors
- withstands high overload, vibration, corrosion



FREE SAMPLE
upon request.
Write today!

IN STOCK FOR
IMMEDIATE
DELIVERY

DOSSERT REPRESENTATIVES IN PRINCIPAL CITIES



Four lamps, two on each pole, are of the concentrated projector type, and are aimed at the steeple. This permits the steeple to be lighted to the same brightness as the building front, because of their concentrated beam pattern.

The remaining six lamps, three on each pole, are of the reflector flood type, and are adjusted to direct their

beams uniformly over the entire front of the building up to the roof, including the building offsets on each side.

This lighting and all related electrical wiring was installed by the G and R Electric Company of Augusta. The results far exceeded the expectations of all concerned, and many favorable comments have been received by church officials.

Floodlighting Identifies Store

Loveman's department store in Birmingham, Alabama, has intelligently used exterior floodlighting to attract the attention of visitors and customers to their store, and as a means of identification by association. It was installed for year-round use, but was approved for installation originally if the job could be completed by a November 27 deadline, in time for use during the pre-Christmas shopping season.

Formerly, the Loveman building was typical of and similar to some eight or ten other buildings in the same downtown area. Its facing was white stone, and it occupied a corner location. Juneman Electric Company, doing some relighting work inside, recognized the possibility of using floodlighting to accent this building, make it different, modern, and first in this area to light up the exterior.

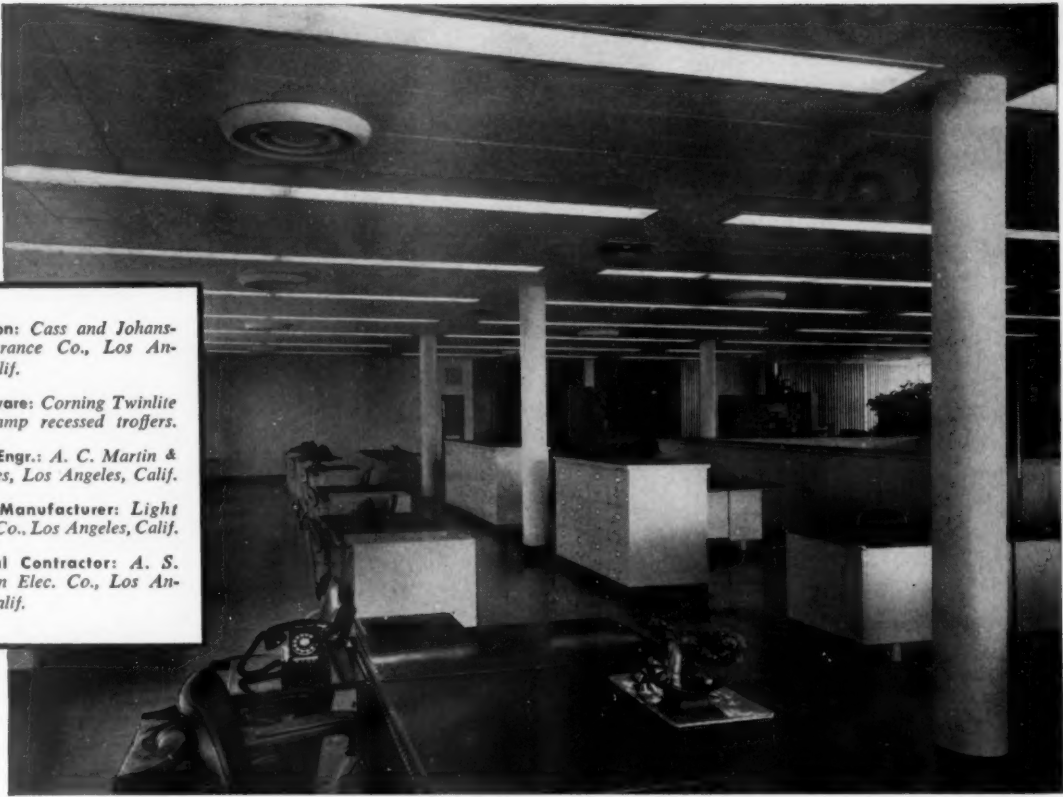
Just at this time General Electric's new PAR-56 300-watt reflector lamp came to the attention of L. E. Johnson, Juneman Electric engineer. "Just the thing to light up the Loveman building efficiently and effectively," Johnson

decided. Its small size and 100,000 candlepower narrow beam were ideally suited for lighting up the white stone column facing between windows with the units concealed on a narrow ledge, he told the store officials. He offered a demonstration, which they agreed to, and which was carried out with three lamps in adjustable weatherproof housings installed in front of one column. Store officials watched as the electricians made beam adjustments, and selected and approved the narrow beam units if the installation could be completed within 20 days. The order was accepted on this basis and the job completed on schedule.

The completed job included the use of the PAR-56 lamps in 27 Stonco flexi-mount housings, with a clear protective lens installed about two inches above each lamp to shield it from the weather. Power is supplied to the units over a system of pancake mold and okolite wire, installed on the exterior of the building and fed at four points only to eliminate the drilling of concrete and limestone.



CUSTOMERS are attracted to Loveman's department store in Birmingham, Ala., by the artistic exterior floodlighting of the building using narrow beam PAR-56 reflector lamps concealed on narrow ledge at base of each white stone column.



Installation: *Cass and Johansing Insurance Co., Los Angeles, Calif.*

Lightingware: *Corning Twinlite in two-lamp recessed troffers.*

Arch. & Engr.: *A. C. Martin & Associates, Los Angeles, Calif.*

Fixture Manufacturer: *Light Control Co., Los Angeles, Calif.*

Electrical Contractor: *A. S. Schulman Elec. Co., Los Angeles, Calif.*

The illumination achieved in this engineered lighting assignment is approximately 55-foot candles.

Insurance firm solves two lighting problems at once

Just think—combining beauty and high lighting efficiency used to be one of your toughest problems. Now—it's one of your easiest!

This insurance office is a case in point. Requirements called for high illumination—necessary to facilitate comfortable reading of detailed information—and functional beauty to match a modern office.

In this case, CORNING Twinlite panels provided efficiency with beauty. A prismatic fluorescent lightingware made of water-white crystal glasses, CORNING Twinlite panels give controlled bright-

ness with true color transmission.

Prisms accurately direct light to working areas and they keep glare from critical zones. Twinlite panels have a special configuration on their back surfaces. CORNING Twinlite is excellent for use in banks, stores and restaurants. You can order Twinlite in flat and curved panels in a standard width of 11 inches and a standard length of 50 inches. And you can use Twinlite with low ceilings or high. Your clients will endorse your selection of Twinlite for its beauty, its efficiency—and for its easy cleaning.

You can call on Corning to help you simplify many lighting problems. Corning makes lightingware for prismatic fluorescent, diffusing fluorescent, louvering fluorescent and prismatic incandescent applications. "Architects and Engineers Handbook of Lighting Glassware" gives you the facts on all of them.

You'll find this handbook helpful in estimating lighting requirements and in writing specifications, too. It suggests lighting plans to help you even further. Let us send you a free copy. Mail the coupon today.



CORNING GLASS WORKS
CORNING, N. Y.

Corning means research in Glass

CORNING GLASS WORKS, Dept. EC-8, Corning, N. Y.

Please send me a copy of the "Architects and Engineers Handbook of Lighting Glassware," LS-43.

Name.....Title.....

Company.....

Address.....

City.....Zone.....State.....

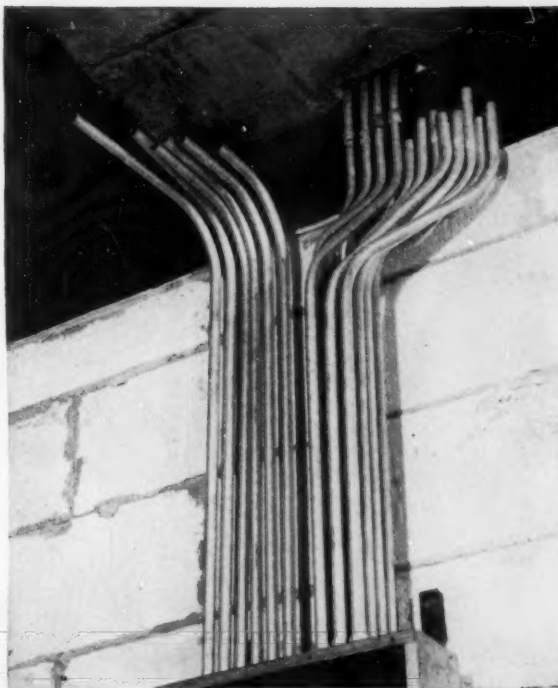
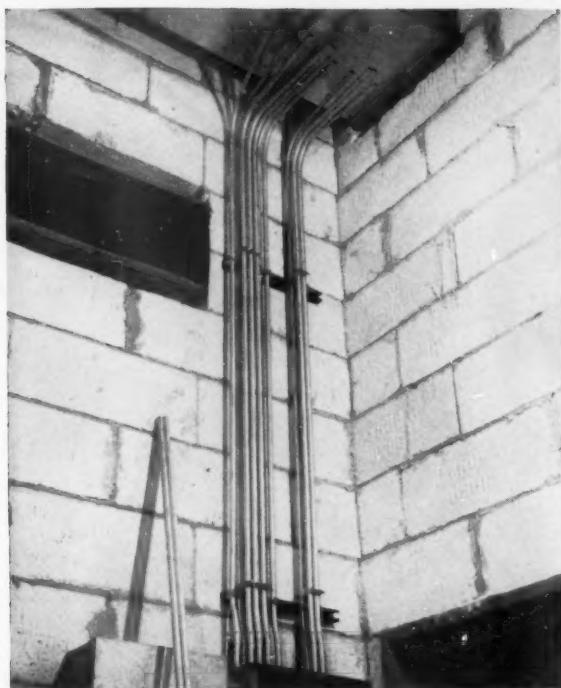


Hudson's Northland, a branch of The J. L. Hudson Company department store, in the heart of the new Northland regional shopping center in Detroit. Hudson's can be easily reached from lower-level parking field and ramped bus road shown here. Republic "Inch-Marked" E.M.T. was used on this project.

HOW TO CUT WASTE ON JOBS



Aerial view of Northland, showing Hudson's store in the center. Store fronts total $1\frac{1}{4}$ miles, equal to all building frontage on both sides of New York's Fifth Ave. from 34th to 51st St. plus one side of the Avenue to 52nd St.



Bends are made easily and accurately when you use Republic "Inch-Marked" E.M.T. Multiple runs are all in place, ready for the next runs to be joined with threadless fittings, connectors and couplings. And in close quarters, joints can be made without turning the whole run. Wire-pulling is up to 30 per cent easier because of Republic E.M.T.'s exclusive inside-knurling.

LIKE DETROIT'S NORTHLAND SHOPPING CENTER

HERE'S THE ANSWER: Use Republic "Inch-Marked" Electrical Metallic Tubing.

HERE'S WHY: These exclusive "Inch-Marked" lengths are easier to cut accurately. Your electricians measure the distance, not the tubing. What happens? No wasted effort.

There are other reasons, too. Like the smooth, accurate bends journeymen can make. All they do is line up the "Inch-Marks" on the tubing with marks on the Republic Calibrated Bender. Ductile Republic Steel, quality controlled, insures smooth bends, inside and out.

Exclusive inside-knurled surface means easier wire-pulling. Up to 30 per cent easier. Easier "fishing," too.

There are no threads to cut, either. Connectors and couplings go over the tube to make tight joints, without turning the whole raceway or cutting away the galvanizing.

Your job doesn't have to be a big one. You can save on any job with Republic "Inch-Marked" E.M.T. Ask your distributor for it, and start saving.

REPUBLIC STEEL CORPORATION

Steel and Tubes Division

212 East 131st Street, Cleveland 8, Ohio

GENERAL OFFICES • CLEVELAND 1, OHIO

Export Department: Chrysler Building, New York 17, N. Y.





The smooth, blue interior finish of the new G-E WHITE rigid steel conduit makes fishing and wire-pulling easy.

Easy fishing and wire-pulling with new G-E WHITE rigid conduit

The new G-E WHITE rigid steel conduit is lined with a new corrosion-resistant coating, containing a special antifriction agent. This smooth, blue interior surface lets wires slide easily, and cuts fishing and wire-pulling time.

New G-E WHITE also offers easy bending and improved corrosion protection because it is zinc galvanized by the "metallizing" process. This process

bonds a uniform coating of pure zinc to the entire outside surface of the conduit, including threads.

New G-E WHITE metallized conduit, with its completely new interior and exterior finishes, is listed by Underwriters' Laboratories, Inc. Ask your distributor about it, or write Section C35-818, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

Progress Is Our Most Important Product

GENERAL  ELECTRIC

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USE THESE CARDS 

● **PRODUCT NEWS, PRODUCT BRIEFS:**

Use first line of boxes. Insert item numbers of products on which more information is desired.

● **CATALOGS, BULLETINS AND ENGINEERING DATA:**

Use second line of boxes. Insert item numbers of literature desired.

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Use third line of boxes. Insert page numbers of advertisements on which additional information is desired. Where more than one advertisement appears on the page, include the manufacturer's initials.

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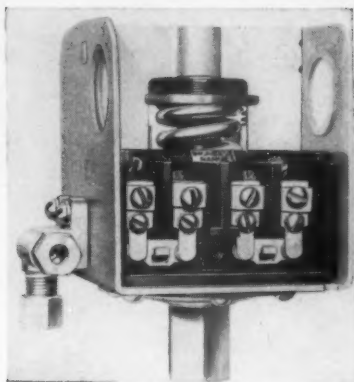
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Product News



Switch

(1)

New Bulletin 10007 heavy duty pressure switch designed specifically for heavy duty applications, such as service station air compressors, industrial air compressors and domestic water pumps over 1 hp. All parts which have bearing surfaces are made of stainless steel—all other operating parts are either of a non-corrosive material or are plated steel. The diaphragm is made of nylon reinforced neoprene. The pressure type terminal connectors assure positive tight contact for one or two wires. "Straight through" wiring is offered by conduit openings on each side of the case for a $\frac{1}{2}$ or $\frac{3}{4}$ inch conduit. Publication EC-77 is available.

Cutler-Hammer, Inc., 228 North 12th St., Milwaukee 1, Wis.



Indirect Luminaire

(2)

This new indirect luminaire is for lighting schools, stores, hospitals, and offices where high efficiency, uniform brightness and a minimum maintenance is prerequisite. Available in either pendant or ceiling type units for use with 300-to 500-watt silvered bowl incandescent lamps. Pendant units come with patented "hang-straight" assembly which allows a 52° latitude of swing for use on slope ceilings. Standard finish is matte-gray.

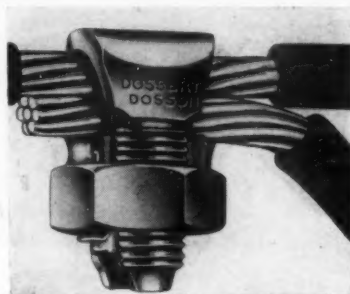
Prescolite Manufacturing Corp., 2229 Fourth St., Berkeley 10, Calif.

Wire Connector

(3)

A corrosion and vibration-proof set-screw wire connector, with smaller outside dimensions for close quarters work and improved knurling over a maximum area of the outer shell for easier application. Connector is available in three sizes for wire combinations from four No. 18 wires through six No. 14, two No. 10 and one No. 12 and many others. The two larger sizes, Nos. 11 and 22, are primarily intended for contractor use and listed by Underwriters' Laboratories, Inc. for 600 volts as pressure cable connectors for general use in branch circuit wiring, machine hook-up, etc., with conduit, armored cable, non-metallic cable and open wiring. A smaller size connector, No. 10, is listed as a 300-volt connector. Catalog data is available.

Ideal Industries, Inc., 1041 Park Ave., Sycamore, Ill.



Connector

(4)

A new split bolt connector known as Dosson "F", has been added to this line. This new connector is a completely cold-formed service connector, possessing the equivalent strength of mild steels. Data is available.

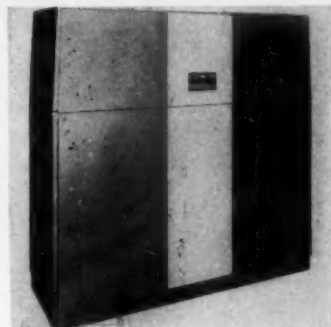
Dosson Manufacturing Corp., 249 Huron St., Brooklyn 22, N. Y.

Chime System

(4a)

A flush-in-wall, multiple chime system, called Moderncall, with two to five chimes installed to operate as a single unit. A different signal for every door tells you immediately which one to answer. Three entrance signals are available. Manually-coded signals for family paging to telephone, meals, etc., can also be provided by connecting a fourth pushbutton. Several methods of mounting may be used, either directly on studs, on wood backing, or conventional metal box hangers.

The Rittenhouse Co., Inc., Honeoye Falls, N. Y.

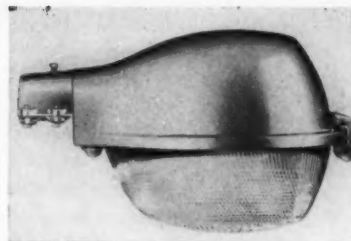


Heat Pump

(5)

The new G-E Weathertron, designed for larger homes and commercial buildings, is powered by two modulated 5-hp compressors and will handle up to 3000 cubic feet of air per minute. It features a completely sealed hermetic refrigeration system. Designated the 98B, it will supplement the present line of 3- and 5-hp models. Air-source heat pumps, using only electricity, extract heat from indoor air in summer and pump it outside the home. In winter, they reverse themselves automatically, pumping heat from the outdoors into the home. Some heat exists in the air no matter how cold it is outside.

Weathertron Department, General Electric Co., Bloomfield, N. J.



Luminaire

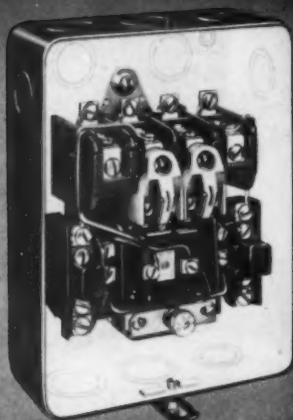
(6)

A new Ovalite luminaire for multiple or series ballasted, mercury vapor systems. It accommodates horizontal mounting C-H5, A-H1, E-H1, and J-H1 lamps and provides a Type III distribution pattern with uniform brightness. It will also accommodate incandescent lamps in sizes up to 15000 lumens. It has been designed to facilitate installation, maintenance and relamping. Lamp positions are adjustable to allow for differences in lamp centers. An adapter is available for positioning the C-H5 lamp. The cast aluminum hood houses the Alzak-treated aluminum reflector and supports the hinged refractor. An automatic, sleet-proof latch holds the refractor tightly against the hood gasket.

Line Material Company, Milwaukee 1, Wis.

Handy Auxiliary Contacts

so simple to add
to your Allen-Bradley starters



Bulletin 709, Size 1, Solenoid
Starter with two auxiliary contacts.



Now—it is easy to add auxiliary contacts to Allen-Bradley solenoid starters to operate extra relays, pilot lights, or other accessories. They can be added in the field to all Sizes 0 through 3 switches.

The operating arm of the auxiliary contact is actuated by the up-and-down motion of the solenoid plunger of the switch. Two auxiliary contacts can be mounted side by side on the arc hood.

Contacts can be changed from normally open to normally closed, or vice versa. This flexibility opens new possibilities for applying Allen-Bradley contactors and starters to automatically controlled equipment.

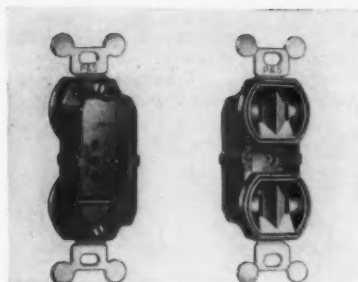
Terminals are accessible from the front. Easy to install and simple to operate. Existing wiring is not disturbed in any way. Trouble free performance is guaranteed. There is no contact maintenance.

Allen-Bradley Co., 1307 S. First St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Limited, Galt, Ont.



ALLEN-BRADLEY
SOLENOID MOTOR CONTROL

QUALITY



Duplex Outlet (7)

The new P&S 1500 duplex outlet features easy-to-wire screwless terminals and double grip contacts. It can be wired in two easy steps—strip wire to gauge (molded in back of outlet) and insert wires in wire holes. When necessary, wires can be removed by inserting pointed instrument in center hole on either side. Double, torsional contacts are of phosphor bronze. Back is insulated. Available in brown and ivory.

Pass & Seymour, Inc., Syracuse, N. Y.



Explosion-Proof Unions (8)

A new self-adjusting expansion type explosion-proof conduit union. Expansion union is a self-contained unit consisting of two parts. It is permanently assembled at the factory. Precision-built, it is explosion-proof under all conditions of expansion. Reduced external diameters permit easy installation in places where conventional unions are difficult to install, and a built-in phosphor-bronze spring insures positive grounding.

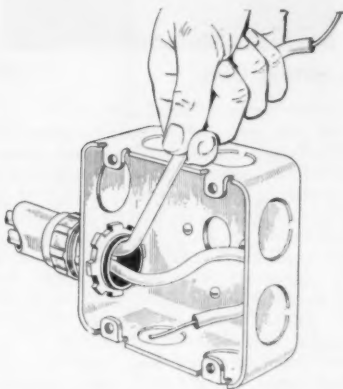
Appleton Electric Company, 1704 Wellington Ave., Chicago 13, Ill.

Relay (9)

A new modulated light beam relay, called Modulite, operates on pulsed rather than steady light. It is particularly useful on such applications as door openers, press and shear safety guards, conveyor controls, intrusion alarms, etc. Light from projector is pulsed several hundred times per second by a scanning disc with holes at its outer edge. Receiver is tuned only to this frequency by RC circuits and peaked transformer coupling. Other features include: water-tight, dust-proof

welded steel case for all-weather operation; reduced voltage light source; plug-in, dust-tight relay with 5-amp DPDT control contacts; tilt and aiming adjustments on both projector and receiver; 2-inch pipe stands for mounting; infrared filter as optional accessory. Literature is available.

Electronic Control Corp., 1573 E. Forest, Detroit, Mich.



Connectors (10)

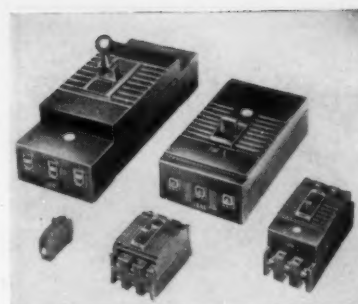
Insulated-throat connectors developed for EMT conduit. Approved by Underwriters' Laboratories, the new device also complies with the National Electrical Code, which calls for smoothly rounded insulating surfaces at raceway terminations to protect wires inside. It is made to accommodate EMT conduit from $\frac{1}{2}$ to 2 inches diameter. It is a butyrate plastic bushing colored bright blue. Protruding slightly from the connector body, the bushing forms a tell-tale blue ring similar to other T&B "blue" fittings. Connector is made from high-strength, steel strip. Another feature is its extra-deep throat.

Thomas & Betts Co., Elizabeth, N. J.

Color TV Equipment (11)

G-E is ready to supply color TV systems for closed circuit use in education, business and industry. Pictures are not broadcast with this equipment as they are from a commercial TV station, but are "piped" from the TV camera through coaxial lines or over microwave relays to home-type receivers or large screen TV projectors. System is composed of four basic elements of equipment. These include color camera; a camera control console; a rack-mounted power supply for providing a regulated source of dc power; and a receiver. All equipment except the camera may be located remote from the scene being televised. Two types of receiver may be used, depending on the size of the group being shown the picture. One, for use with small groups, is similar to a home-type TV console. The other, featuring a specially designed optical system, projects the color image on to a six-foot screen.

General Electric Co., Syracuse, New York.



Circuit Breakers (12)

A new line of Type AB molded case circuit breakers is available. Designed primarily for circuit protection in industrial plants and commercial buildings, they operate on a thermal-magnetic principle that will pass temporary light overloads, but will trip instantaneously on heavy faults. These breakers are available in the Quicklag class and NE, NF, NK, and WL frames. Ratings range from 15 to 600 amperes, 600-volt maximum. They are approved by Underwriters' Laboratories, Inc., meet NEMA and Federal Government Specification W-P-131a.

Federal Electric Products Company, 1429 Park St., Hartford, Conn.



Lighting Fixture (13)

New moisture-proof lighting fixtures for damp locations. Construction permits safe operation in showers, bathrooms, laundries, dairies, barns, garages, etc. Danger of short circuits and shocks from water in units is prevented by special water proof cement which seals wiring and sockets, and by two rubber gaskets, one between fixture and wall or ceiling and the other between shade and fixture. Both have opal glass shades, and one shade has a clear fresnel lens at bottom to concentrate light directly below it. Features include $5\frac{1}{2}$ -in. diameter porcelain bases that fit either $3\frac{1}{2}$ -in. or 4-in. box. Attachment straps are included. The fixture with lens in shade measures 7-in. in over-all length; the other, 6 $\frac{1}{2}$ -in. Both take bulbs up to 100 watts. Rated for 660 watts, 250 volts. Carries label of Underwriters' Laboratories. Literature is available.

John I. Paulding, Inc., New Bedford, Mass.



Now of
cast aluminum alloy

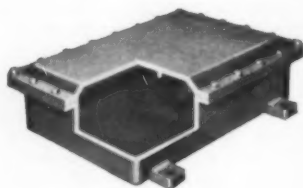
Fit YOUR needs because

- ✓ 1/3 weight of cast iron
- ✓ easily drilled and tapped
- ✓ non sparking
- ✓ rustless, stay clean
- ✓ strength proved by test

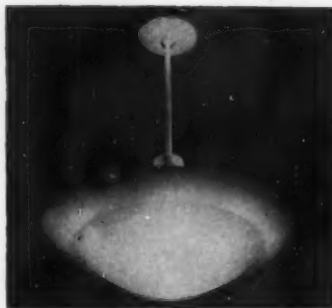
These rugged boxes are ideally suited to mounting onto equipment. Many standard sizes; drilling and tapping, mounting buttons, internal supporting strips and custom modifications are available to your specifications.

Construction meets UL requirements.

Tested to Military Specification MIL-E-5272A



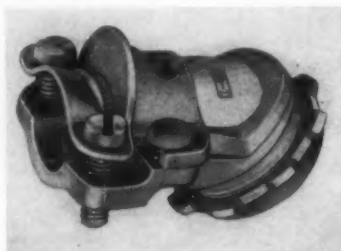
Write for Bulletin F-254



Lighting Unit (14)

Color-corrected lighting is possible with this new series of Even-Glo luminaires. The fixture is ideal for showrooms, stores, schools and offices. Subtle blue color-tones are denser near the lamp and reduced in the outer rings to allow more translucence and reduce the glare. Ceramic coating on glass will not discolor or deteriorate. 3/6-in. glassware has been annealed for strength and is available in 18-in. or 21-in. bowls. Finished in gray baked-on enamel, the fixture is designed to use 300- to 500-watt inside frosted incandescent lamps. Available in either pendant or ceiling type units. Patented "hang-straight" assembly on pendant units allows 52° latitude of swing for use on slanted ceilings.

Prescolite Manufacturing Corp., 2229 Fourth St., Berkeley 10, Calif.



Connector (15)

The 45° angle connector No. 315 has been added to this line. It can be used on either round or oval shaped cables. Connector is used to secure armored cable, armored lead cable, flexible steel conduit, non-metallic sheathed cable, rubber cord or service entrance cable. Made of high quality aluminum alloy, the connector is available in sizes of 1/4-in., 1/2-in. and 3/4-in.

Blackhawk Industries, Dubuque, Iowa.

Instrument (16)

New double range model JX hand tachometer with stop button feature to hold readings until released. Instrument is of the centrifugal mechanical type which has a range of 50 to 5000 rpm, and 25 to 2500 fpm. It comes in a velvet-lined carrying case, has an 8-in. long 360° scale with 225 scale divisions and speeds can be read to as close as 1 rpm on the low range. Tachometer operates in either

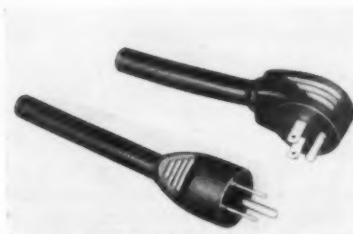
direction of rotation, is unaffected by changes in temperature, stray electric currents or magnetic conditions and comes with a full set of accessories. Bulletin No. 765 is available.

Herman H. Sticht Co., Inc., 27 Park Place, New York 17, N. Y.

(17)



SERVICE BODY for heavy duty line construction and maintenance work with 4-man crew compartment. Designed for chassis rated 2 to 2 1/2 tons, it has an overall length of 13 1/2 feet, with a CA dimension of 108 inches. Interior features include deep lipped stowage shelves running across front and along each side of main compartment; choice of double drum winch or air compressor; rear door with window; and, forward, a 4-man crew compartment with two porthole type windows. Exterior features include: two section sliding roof; ladder hooks; hand grips; rear step; towing hook; threading machine; derrick poles and mounting bracket. Manufactured by Morysville Body Works, 813 S. Reading Ave., Boyertown, Pa.



Attachment Caps (18)

A complete line of straight and 90° angle molded rubber 3-conductor male attachment caps, with blades and grounding pins positioned according to the National Electrical Code regulations effective next January. These straight and right angle plugs feature parallel blades for 15-amp, 125-volt operation, or with tandem blades for 15-amp, 250-volt operation. Wire gauge sizes from 12-3S to 16-3SJ, inclusive, are covered. All are UL approved. The ground wire of these new plugs is secured to a contacting pin projecting from plug end parallel to the blades. Blades have been repositioned according to their rating. Bulletin C442 is available.

The Cords Limited Division of the Essex Wire Corp., DeKalb, Ill.

where reliability is the first requirement . . .

it's **SPANG®** Conduit

for Manhattan's new Beekman-

Downtown

Hospital

The new, modern Beekman-Downtown Hospital, located on New York's East Side, was especially designed to serve the unusual variety of medical needs found in this type of neighborhood. This 5½-million-dollar hospital is equipped with an extensive out-patient department for accidents and emergency work, large charity wards and beautifully equipped private rooms—plus especially attractive quarters for interns, nurses and other staff members.

The many and unusual electrical requirements of a hospital call for the very finest electrical installations. That's why Spang Conduit was chosen to protect the wiring throughout the building. Spang Conduit is quality-controlled from raw material to finished product. This means Spang Conduit is easier to work with . . . easier to cut, bend and thread . . . providing an economical, time-saving installation.

And where reliability is so important, a Spang installation can be counted on to give years of satisfactory and dependable service. Ask any architect or contractor. They'll tell you the same thing.

Specify Spang for your next job. Take your choice of Spang Cenlaco "Hot-Dipped," Spang Central White Electrogalvanized, Spang Central Black or the new Spangleam EMT. Your distributor carries the complete Spang line.

Owner: Beekman-Downtown Hospital,
New York City

Architect-Engineers: Lorimer & Rose,
New York City

Structural Engineers: Roberts & Schaefer
Company, New York City

Mechanical Engineers: Karsunky, Weller
and Gooch, Washington, D.C.

General Contractor: Cauldwell-Wingate
Company, New York City

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Company, New York City

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Company, New York City



SPANG®
CONDUIT

SPANG-CHALFANT

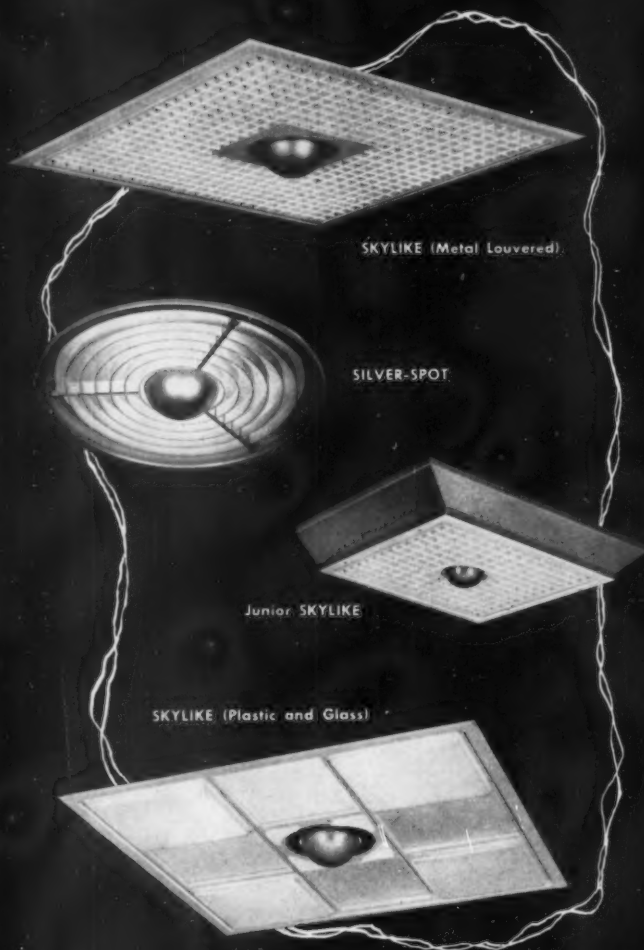
Division of The National Supply Company
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SKYLIKE SILVERED BOWL INCANDESCENT LIGHTING SYSTEMS

For Recessed, Semi-recessed or Surface Mounted
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DETAILED BULLETINS are available upon request. Just
write the name of the unit(s) on a post card and mail to...

Skylike LIGHTING, INC.

A SILVRAY ASSOCIATED COMPANY

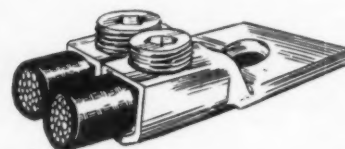
BOUND BROOK • NEW JERSEY



Lighting Unit (19)

A new indirect incandescent lighting unit, called Verticon, has baked white enamel vertical concentric louvers. It uses 300- or 500-watt silvered bowl lamps. Outer ring of shallow design is 4 inches deep and has a 16½-inch diameter. Inner louvers are 1-inch deep. Visual comfort is assured by 45° shielding. Unit relamps through center louver by hand or lamp changer. Approved by Underwriters' Laboratories.

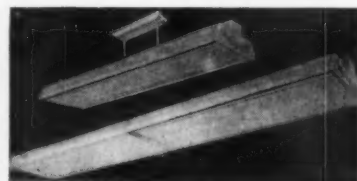
The Art Metal Co., Cleveland 3, Ohio



Twin Connector (20)

A new twin connector, MU, is designed to replace a larger single connector. MU accommodates two wires and is available in three sizes: MU 250 for 250 MCM 6-wire range, MU 350 for 350 MCM 4 wire range and MU 600 for 600 MCM to 4/0 wire range. MU is produced from heavy, extra hard drawn seamless copper tubing. It has been tested by Underwriters' Laboratories and the Canadian Standards Association. Catalog is available.

*IlSCO Copper Tube and Products, Inc.,
Mariemont Ave., Cincinnati 27, Ohio.*

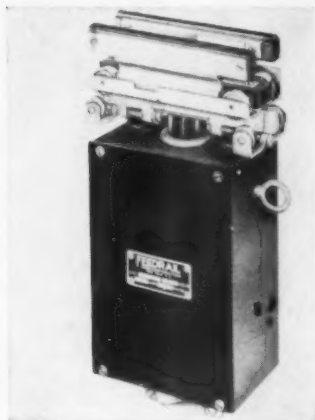


Fluorescent Fixture (21)

Ten luminaires are featured in the "Polaris" group of the "Milestone" series. The "Polaris" has an ultra-shallow contour for streamlined installations. Lighting efficiency is achieved through translucent "Evenglo" plastic sides, which produce a low surface brightness, and Penticore

Prismatic glass shield with 85% transmission factor. A concealed combination hinge and latch on each side of unit permit easy removal of glass shield from either side. Rapid-start units also are available with the new models. Eight 4-foot and two 8-foot luminaires, with either two or four lamps are available. There is a choice of four lamp types: T-12 medium bi-pin, T-12 medium bi-pin instant-start, T-12 rapid-start and T-12 slimline. Units may be suspension mounted individually or in continuous rows.

Mitchell Manufacturing Company, 2525 Clybourn Ave., Chicago, Ill.



Trolleys

(22)

Two new special service trolleys rated at 100 amperes—equal to the full current carrying capacity of the Feedrail "100" track—are available. Their ability to handle capacities higher than available through the present standard or duplex type trolleys makes them ideal for overhead travelling cranes, hoists and similar equipment with motor loads up to 60 hp at 550 volts ac. Both two- and three-pole trolleys are furnished completely assembled and internally wired. The chassis is of one-piece heavy gauge steel. Totally enclosed ball bearing support wheels, horizontally mounted ball bearing guide wheels, and self-lubricating undercarriage wheels assure perfect alignment of trolleys in the Feedrail "100" track. A polarizing tab prevents insertion of trolley in improper polarity. Bulletin No. 37 is available.

Feedrail Corporation, 125 Barclay St., New York 7, N. Y.

Cord

(23)

A new, utility grade portable cord, called "Rancho". The cord is made in two types—S, 600-volt, and SJ, 300-volt. Rancho Type S is made in sizes 18 through 10 with two, three, or four conductors. Rancho Type SJ is made in sizes 18 and 16 with two or three conductors. Cords are made with a rubber outer jacket and rubber insulation. They bear the label of Underwriters' Laboratories, Inc.

Western Insulated Wire Co., 2425 East 30th St., Los Angeles 58, Calif.

SILVRAY INCANDESCENT & FLUORESCENT LUMINAIRES FOR EVERY LIGHTING APPLICATION

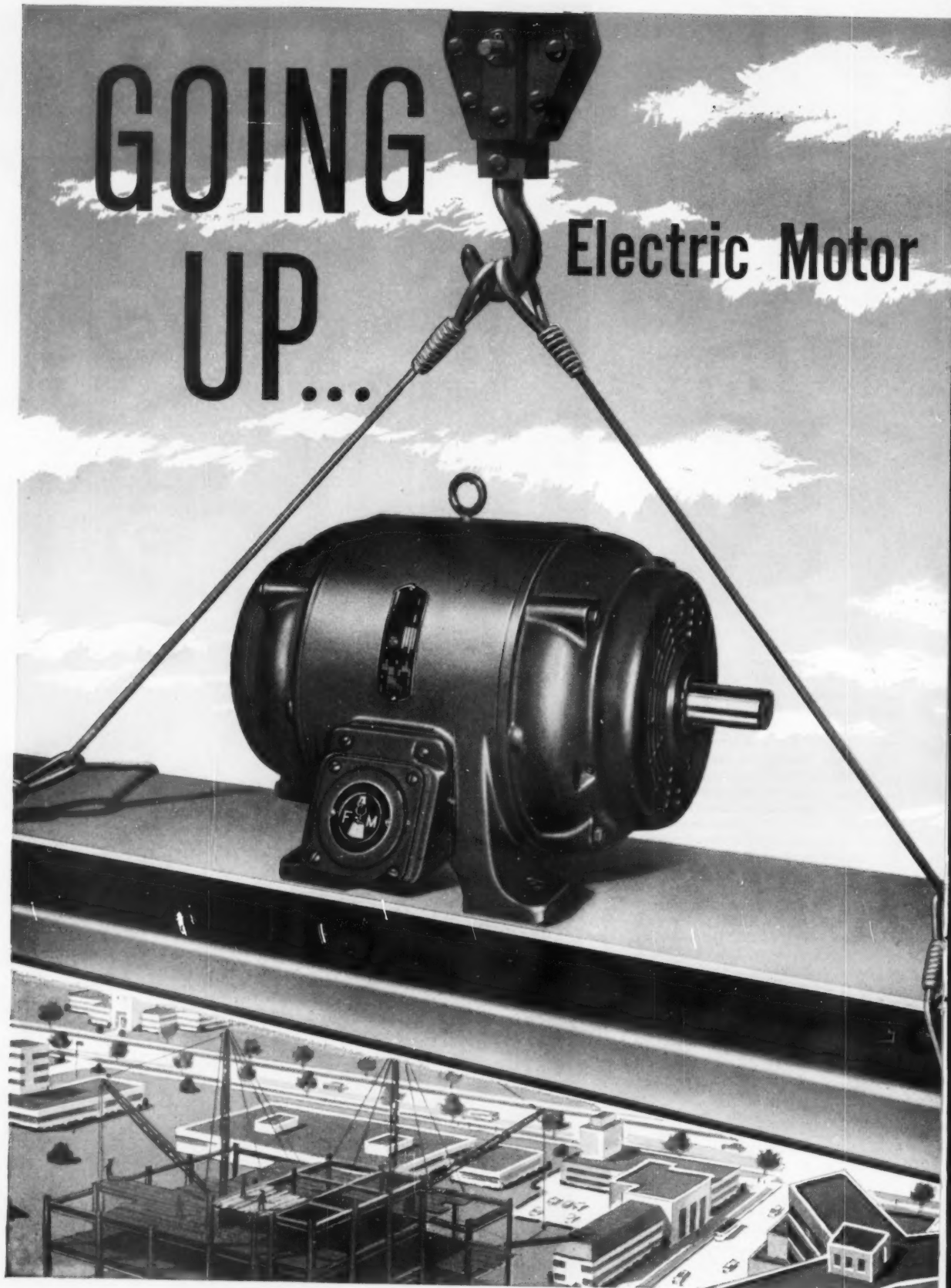


DETAILED BULLETINS are available upon request. Just write the name of the unit(s) on a post card and mail to...

Silvray LIGHTING, INC.
BOUND BROOK NEW JERSEY

GOING UP...

Electric Motor



Performance!

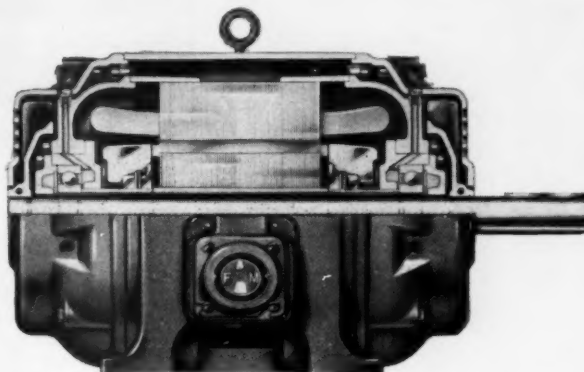
To a towering structure of design achievement Fairbanks-Morse adds still another outstanding member . . . a compact new enclosed motor . . . backed by an engineering tradition which has been a-building for more than a century.

That tradition is
More Performance in Less Space.

You, as a buyer of electric motors, will benefit by that tradition . . . just as the users of Fairbanks-Morse diesel engines, pumps, scales, locomotives and the many other F-M products are today enjoying the advantages of finer performance.

Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Illinois.

NEW FAIRBANKS-MORSE TOTALLY ENCLOSED FAN-COOLED MOTORS



TOTALLY ENCLOSED—Wherever adverse operating conditions are encountered, F-M totally enclosed construction effectively insures electrical parts and bearings against contamination by dirt, abrasive dusts, metal particles, corrosive gases and steam.

DOUBLE-END VENTILATION—Cooling air is drawn through guarded openings in both fan shields and uniformly circulated through cored passages surrounding the sealed inner shell. Efficient heat-transfer action insures uniform internal cooling. Exhaust air is discharged through bottom of frame—not across motor and driven machine.

COPPERSPUN ROTOR—Exclusive Fairbanks-Morse feature—an indestructible one-piece rotor—homogeneous, free from flaws for maximum strength and lifetime service.

CONDUIT BOX—New, gasketed, cast iron conduit box permits easy pulling of cables without insulation damage. Fairbanks-Morse exclusive: recess feature allows elimination of conduit box where space is limited.

BEARINGS—Precision ball bearings are effectively sealed against grease leakage and contain ample lubrication for extended periods of rugged service. Convenient means are provided for flushing and re-lubricating if desired. Cartridge bearing construction is standard on all larger ratings.

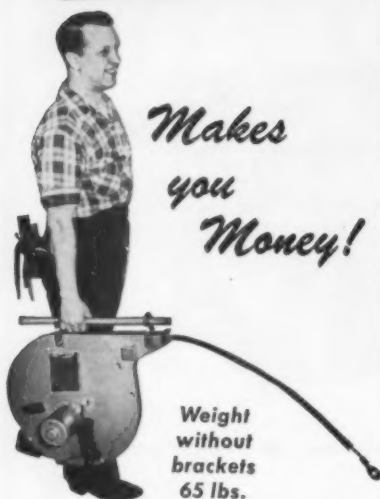


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a name worth remembering when you want the best

ELECTRIC MOTORS AND GENERATORS • DIESEL LOCOMOTIVES
AND ENGINES • PUMPS • SCALES • RAIL CARS • HOME WATER
SERVICE EQUIPMENT • FARM MACHINERY • MACHINERY

THE ONLY COMPLETE WIRE-PULLING POWER TOOL



*Makes
you
Money!*

Weight
without
brackets
65 lbs.

ONLY ONE SETUP IS NEEDED!

PUSHES 45 Ft. of fish tape per min.
PUSHES around five 90° bends.
STOPS automatically if obstructed.
PUSHES 175 Ft. of .060" x 1/4" usable highest
quality tape.
MAY BE USED in any position.
INDICATOR shows how many feet of tape is
pushed into conduit.

PULLS 17 Ft. per minute, full load.
PULLS 1200 Lbs. (equals pull of 8 men).
PULLS wire in 3/4" to 2" conduit.
OPERATES on 115 Volt AC or DC Current.
RUGGED, Heavy Duty Construction.

SAFE! The fish tape is always in the conduit
or in the tool . . . never free to come in con-
tact with moving machinery, bus bars, live
wires, etc.

AVAILABLE { General Electric Supply Co.
THRU YOUR { Graybar Electric Co.
NEAREST { Westinghouse Electric Supply Co.

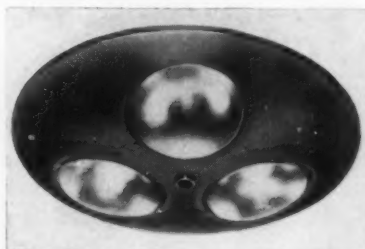
The **BARTH**
CORPORATION
12652 BROOKPARK RD., CLEVELAND 29, O.



Fluorescent Brackets (24)

Two new fluorescent bracket lines featuring all-chrome bracket with adjustable, perforated reflector. Both lines are suited to many home and commercial lighting needs. "Bellaire" brackets are finished in triple chrome plate or gold plate, with matching reflectors. "Patrician" open-type brackets come in either triple chrome plate or polished brass finishes. Both brackets are also available with decorator styled glass shields trimmed in gold or silver. "E-Z Off" removable reflector takes only seconds to remove for lamp replacement and cleaning. Finger-tip adjustment tilts reflector.

Markstone Manufacturing Co., 2460
West George St., Chicago 18, Ill.



Heater (25)

New infrared ceiling heater for bathrooms, directs heat rays from ceiling to floor. It is a recessed fixture installed between ceiling joists. Unit is pre-wired to a built-in pull box, and does not require a special circuit. Available in one-lamp and 3-lamp units with either chrome or painted finish. It is UL approved and is cleaned by wiping the surface. It accommodates R-40 infrared lamps.

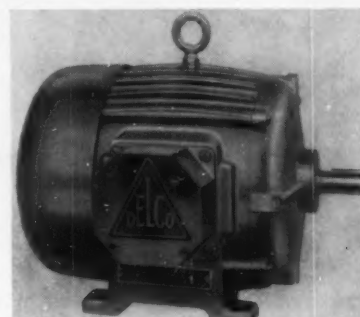
Pryne and Company, 142 North Towne
Ave., Pomona, Calif.

Air-Cooled Unit (26)

Waterless home cooling is made possible by a new air-cooled condenser, which can be located remote from the cooling unit in crawl space, attic, garage, or backyard. Because of the remote location feature, ducts are not needed to carry air to and from the condenser. There will be an air-cooled counterpart for every water-cooled unit in the line including upflow, downflow, and horizontal-flow models. Each of the new air-cooled home cooling units consists of two sections. The evap-

orator section, which actually cools the home, contains the cooling coil, hermetic compressor, electrical equipment, and high and low pressure switches. These components are mounted on a framework which will slide out for servicing. The second component, the air-cooled condenser section, which gets rid of the heat, contains the condenser coil, blower, and liquid receiver. Condenser package is 2 feet high, 3 feet deep, and 2 or 3 feet wide. Units are available in 2-, 2½- and 3-ton sizes, with 1½- and 5-ton models to be available later this year.

General Electric Co., Bloomfield, N. J.



Motors (27)

A new line of ac, squirrel cage, induction electric motors in frame sizes from 182 through 326, to meet the new NEMA standards on re-rated frame sizes. One of the newly designed motors is the open drip-proof motor which features cast iron main and end frames, aluminum die cast rotors, grease lubricated double-shielded ball bearings, the exclusive "Deltocote" cotton and varnish insulation and a drip-proof baffle cast as part of the end frame which protects the motor from dripping liquids. Another motor is the totally enclosed fan cooled motor. It is built with sturdy ribbed frame construction which allows the external fan to direct air efficiently over the smooth ribbed frame. Cooler operating temperatures are obtained with the new design and cleaning problems are negligible.

Delco Products Division of General
Motors Corp., Dayton 1, Ohio.

Lighting Fixture (28)

A new, rapid-start, recessed ceiling fixture, designed for single or continuous installation has been added to the Sightron line. The new 48-inch long unit is ideal for general lighting application in stores, offices, institutions and commercial interiors. The fixture consists of a smooth, hinged white polystyrene diffuser, housed in a 20 gauge steel baked white enamel assembly. Lamps and chassis are enclosed. Concealed hinges swing diffuser down for maintenance. Unit is designed to fit a standard 12-inch ceiling opening. It is for use with two or three 40-watt rapid-start lamps. Catalog is available.

Lightolier, Inc., Architectural Lighting
Division, 346 Claremont Ave., Jersey City
5, N. J.



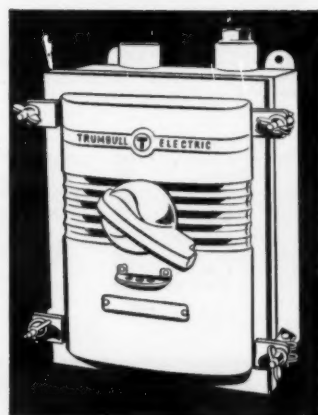
NEW...from General Electric


**Lead plated switch and circuit breaker enclosures
exposed to weather, dust, alkali or acid atmospheres**

A tremendous improvement over cast iron...less bulky, lighter and practically unbreakable. Easier to handle, requires less maintenance, lasts much longer.

Water-tight and dust-tight (NEMA 4 & 5) lead plated, sheet steel enclosures are available immediately through your General Electric-Trumbull Distributors. Safety switches 30 through 200 amperes; circuit breakers 15 through 225 amperes.

Inspect this important new General Electric development before your next switch or circuit breaker order. Write, wire, or phone General Electric Company, Trumbull Components Department, 42-63 Woodford Avenue, Plainville, Connecticut.



You can put your confidence in—
GENERAL  ELECTRIC

for easier, safer,
faster
testing...



the **KNOPP**
Voltage Tester
with the patented
PROD - MOUNT



has **5** Safety Features
... many uses

When you get the pace-setting Knopp Voltage Tester you say "Goodbye to risky, time-wasting fuss in testing" because of 5 main safety features: (1) exclusive Prod-mounting Socket in housing making this tester easier, faster, and safer to use; and ending time-wasting "three-handed" testing; (2) protection through dual indication of voltage by solenoid and neon lamp working independently; (3) positive scale readings; (4) signal by hum and vibration; and (5) thorough insulation throughout, even to the sharp point of each prod.

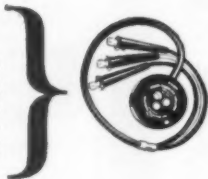
Well-built and shock-proof in a LAMINATED Bakelite housing, the Knopp Voltage Tester tells immediately and simply if circuit is open or closed; magnitude of voltage between 110 and 600; a-c or d-c, pure or rectified; 25 or 60 cycles, for testing old and new circuits, fuses, locating grounds, etc.

Some of the nation's largest utilities, after testing all brands, use Knopp Voltage Testers by the hundreds.

Get the widely-used, reliable Knopp Voltage Tester with the exclusive, time-proved Prod-Mount, and other safety features, from your dealer, or write for illustrated, free, new, descriptive Bulletin No. 425.

THE KNOPP
Phase Sequence
Indicator

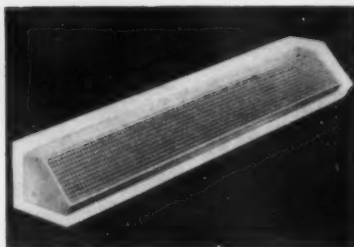
60 v. to 600 v.; 25 to 60 cycles; Rotating Indicator shows sequence A-E-C or C-B-A. Light - weight. Compact. Big time saver.



KNOPP

Electrical Facilities Inc.

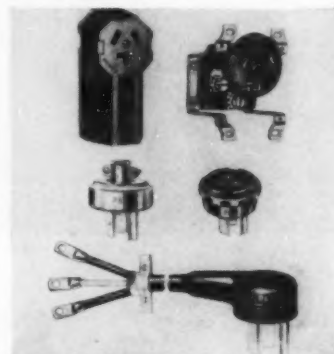
4232 HOLDEN STREET, OAKLAND 8, CALIF.



Fluorescent Unit (29)

The "2-in-1" Gratelite cove and bracket fixture may be used as a cove indirect or a direct downlite. It mounts either way without extra gadgets or any change in the fixture. 80% of the light is beamed directly upward and outward, 20% is beamed downward to brighten side walls. The movement of air through the open $\frac{1}{2}$ -in. cubes creates a "breathing action" that keeps the shield cleaner and lamps cooler. As a cove light, the fixture is suited for installations such as offices, restaurants, school rooms, and as a downlite, in barber shops, fitting rooms, over hospital beds, etc. Literature is available.

Edwin F. Guth Company, St. Louis 3, Mo.



Wiring Devices (30)

The new P&S line of 30-ampere, 3-wire receptacles, caps and cord sets have L-shaped slots and blades, and are designed for dryer installations. The line consists of No. 3836 black surface receptacle (No. 3836-W, white); No. 3835 flush receptacle; No. 9331 plastic cap; Nos. 9337 and 9338 armored cord grip caps; No. 9339 rubber cord set in 36-in., 48-in. and 60-in. lengths. Both surface and flush receptacles have "lay-in" type pressure terminals.

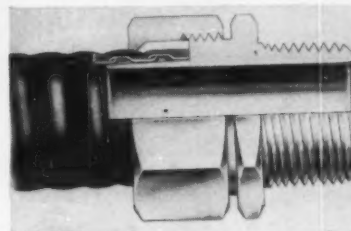
Pass & Seymour, Inc., Syracuse 9, N. Y.

Fluorescent Starters (31)

A complete line of fluorescent lamp starters of utility, automatic and pushbutton reset types. Precision timing insures rapid-starting, and exact pre-heating for each particular type and size fluorescent tube. Starters carry UL and ETL endorsement. Contact points have extraordinary corrosion resistance. Basic elec-

trical characteristics include glow tube and condenser. Both the automatic and pushbutton resets instantly and automatically cut a fatigued or defective lamp out of the fixture circuit.

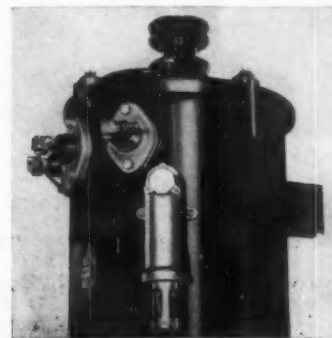
Amplex Corporation, 111 Water St., Brooklyn 1, N. Y.



Connector (32)

A new improved connector for liquid-tight flexible conduit, designated series "CT". It is for use with "Sealtight" flexible conduit. Improvements are: extra strong grip; highly efficient ground; permanent seal; and displaced bending action. "CT" series connectors can be installed assembled. Available in straight, 45° and 90° types for $\frac{1}{2}$ -in. to 2-in. liquid-tight flexible conduit. They meet UL and J.I.C. standards.

The Pyle-National Company, 1334 North Kostner Ave., Chicago 51, Ill.



Indicator (33)

A new ambient-compensated transformer overload indicator designed for installation on transformers in service or for integral factory mounting on new transformers. It provides visible indication of overload by means of a drop-down red light or a drop-down luminescent tube. Indicator is factory-adjusted to indicate an overload when transformer winding hot spot temperature reaches approximately 95°C. It consists of a tank wall heat receiver and an ambient temperature receiver mounted in a moulded phenolic-resin housing. When the red light indicator is used, a two-conductor cable is furnished for connection to the 120-volt transformer terminals. The cable has an 18000-volt BIL while the indicator has the same BIL as the transformer secondary.

Line Material Company, 700 W. Michigan St., Milwaukee 1, Wis.

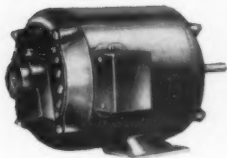
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From the Wide
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In Sizes From 1/3 to
400 Horsepower



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Split Phase Induction—1/4, 1/2, 1 H.P.

Capacitor—1/4 to 20 H.P.

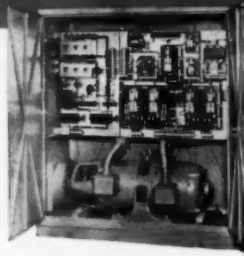
Repulsion start, brush lifting,
induction—1/2 to 7 1/2 H.P.

Write for Bulletin Nos.:

Split Phase 1-5P1

Capacitor 1-1P3

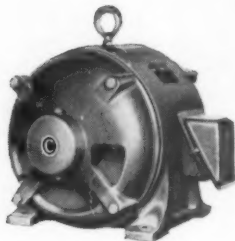
Repulsion Start 2-1P1



SELECTIVE SPEED DRIVE:

A complete line of adjustable
speed drives for coordinating all
kinds of production processes.

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POLYPHASE:

Squirrel Cage Induction—
1/2 to 400 H.P.

Wound Rotor Motors—1 to 400 H.P.

Synchronous Motors—20 to 150 H.P.

Write for Bulletin Nos.:

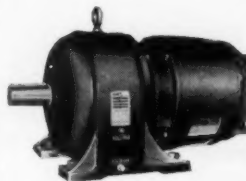
Squirrel Cage, Drip Proof—4-1P1

Squirrel Cage, Splash Proof—4-1P3

Squirrel Cage, Enclosed Fan Cooled—4-1P41

Squirrel Cage, Explosion Proof—4-1P45

Wound Rotor—4-3P1



GEAR MOTORS:

1/2 to 15 H.P., single, double and
triple gear reduction.

Write for Bulletin Nos.:

1/2 to 3/4 H.P. . . 4-5P21-61

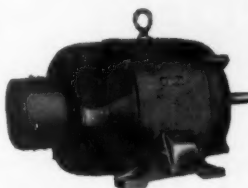
1 to 15 H.P. . . 4-1P31



DIRECT CURRENT:

All capacities—1/2 to 300 H.P.

Write for Bulletin No. 10-1P1



GENERATORS:

AC, .63 to 250 KVA

DC, .75 to 200 KW

Write for Bulletin Nos.:

AC, .63 to 250 KVA—18-1P21

DC, .75 to 200 KW—18-1P1

Motors listed above are available in Open
Rated Drip Proof, Splash Proof, Totally
Enclosed Fan Cooled and Explosion Proof
frames—and with a dozen different methods of
mounting. They are unusually quiet starting
and running and unusually free from vibration.



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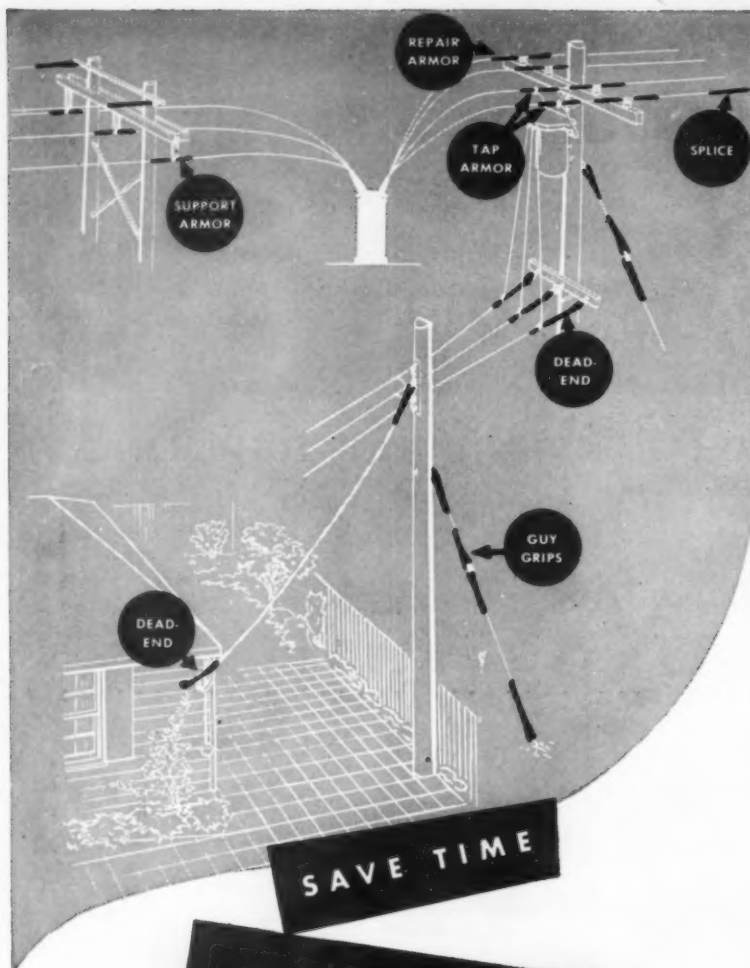
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CE-825R



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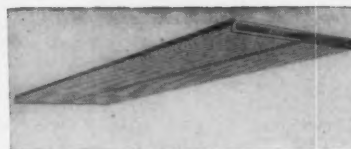
Go Preformed

The Preformed Products shown above are establishing new service standards. Not only do they save countless man-hours of installation time, but also they assure a uniformity and efficiency of application unattainable by any comparable devices. They require no clips or clamps and can be installed easily by hand in most cases.



For complete details of their exclusive advantages, write or telephone Cleveland: EXpress 1-3571

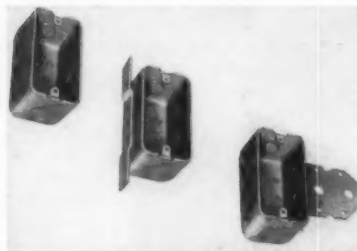
PREFORMED LINE PRODUCTS CO.
5349 ST. CLAIR AVENUE, CLEVELAND 3, OHIO



Fluorescent Unit (34)

Designed for use wherever low brightness contrast interior illumination is desired, the new Arealux is a shallow, wide area fluorescent luminaire ideal for school classrooms, libraries, stores and offices. The LPI Arealux, series 164 luminaire, is 35½-in. wide and 5-in. deep. It can be either surface mounted to the ceiling or suspended on hangers, and can be mounted singly, in a continuous row, or side to side. Top reflectors are available where only down light is desired. Three lengths are available: 4-foot, 6-foot, and 8-foot. The 8-foot is available with the new rapid-start fluorescent lamp. The louvers are hinged in 4-foot sections for relamping. Literature is available.

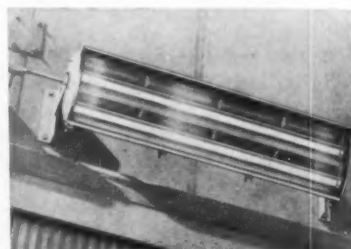
Lighting Products, Inc., Highland Park, Ill.



Boxes (35)

Handy boxes are now available with brackets specially designed for either face or side mounting to studs. "B" Type brackets are suitable for mounting on face of stud, while "V" Type are mounted on side of stud. The brackets are stamped from heavy gauge sheet steel, and are welded to side of box. Specially designed knockout dies assure fast removal from boxes. Nine models are available with various knockout and bracket arrangements. Catalog is available.

Keystone Manufacturing Co., 23328 Sherwood Ave., Center Line, Mich.

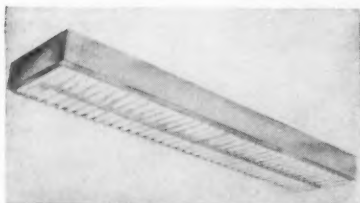


Fluorescent Unit (36)

A new two-lamp fluorescent luminaire has been designed specifically for outdoor applications which require high illumina-

tion but low average brightness, such as airport ramps, airport service areas, parking lots, loading facilities, and commercial business fronts. The luminaire has a main beam output of about 4100 candlepower and an average unit brightness of three candlepower per square inch. It is a 245-watt unit accommodating 100-watt, 6-foot, T-12 lamps. It has individual reflecting surfaces for controlling vertical distribution of light, and entire luminaire is adjustable so that the main beam may be rotated plus or minus 45° from horizontal. All metallic parts are aluminum, except for non-ferrous fittings. Cover is a translucent plastic which is hinged at top and latched at bottom to facilitate relamping.

Line Material Company, Milwaukee 1, Wis.



Fluorescent Unit (37)

A new shallow fluorescent unit called the "Sheraton". It is 3½-in. in depth and can be utilized as a "surface troffer". It is ideal for low-ceiling school rooms and offices. Unit incorporates translucent plastic sides to illuminate adjacent ceiling, and a one-piece steel louver with a cut-off of 30° crosswise, 45° lengthwise. Fixture is available for two or four 40-watt rapid-start, bi-pin lamps (in four-foot and eight-foot housings), as well as two or four 48-in. or 96-in. slimline lamps.

Smithcraft Lighting Division, Chelsea 50, Mass.



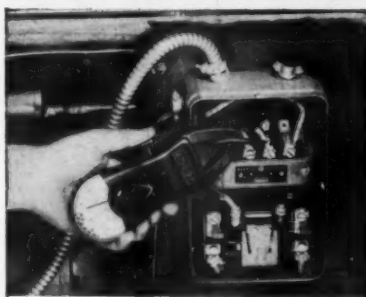
Fish Tape, Reel, Puller (38)

A new 8⅞-inch diameter reel with 100 feet of ¼- by .045-inch tape, is especially designed for residential wiring and as a secondary tool for commercial and industrial work. Fish tape is oil-tempered, flat spring steel of high tensile strength. Reel protects tape and keeps end automatically locked so that it cannot unwind until tape is needed. This 3-in-1 tool speeds wiring, as tape is pulled through conduit in one operation.

Holub Industries, Inc., Sycamore, Ill.



"No shutdowns to take current readings"



"Takes the guesswork out of servicing"



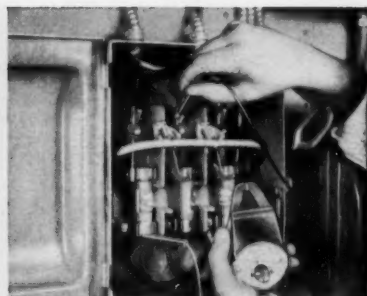
"Periodic motor checks pay off"



"No longer a problem to balance load"



"I can check appliance current at plug"



"A real short cut for checking fuses"

save hours this way!

Did you read the comments under the photos? They're typical reports from Amprobe users in the field, telling us how much easier their work has become now that they can measure current and voltage instantly and accurately, with one pocket tool, without having to shut down equipment.

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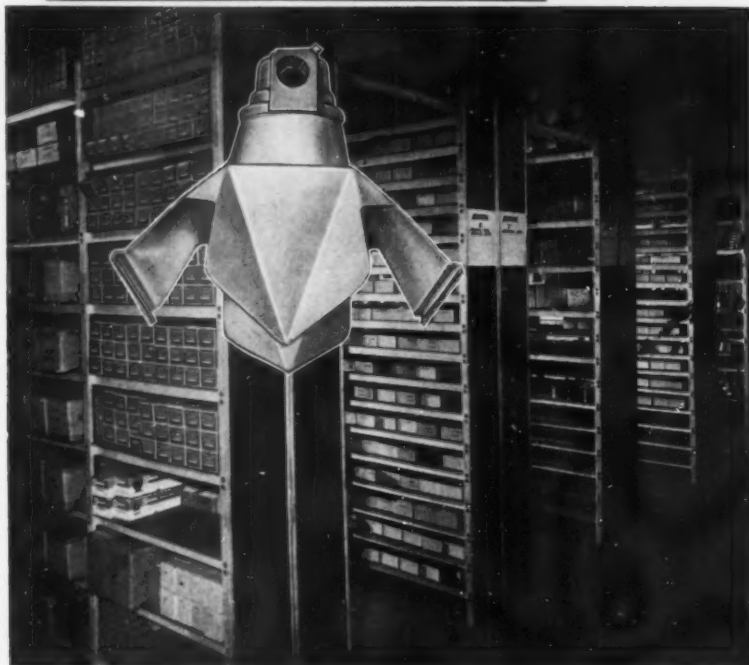
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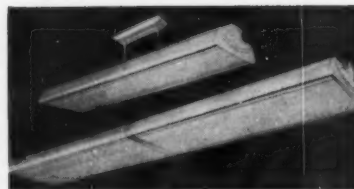
This specialized type of lighting unit has gained wide favor because of its effectiveness. It can be a source of profitable sales for you.

There's a wide spread of light downward and outward to each side of the aisle due to the scientific arrangement of the reflecting surfaces. This QUAD design also assures lighting for the upper tiers of shelving. An eye shielding feature results because of a lower light cut-off angle at each end of the reflector.

QUADRANGLE MFG. CO.

32 S. PEORIA ST.

CHICAGO 7, ILL.



Fluorescent Unit (39)

Ten ultra-thin, streamlined luminaires are featured in the "Thinline" grouping of the "Milestone" series. Designed to provide glarefree illumination, particularly useful in offices, stores, schools and institutions, the "Thinline" series offers three advantages: ultra-shallow contour; "Evenglo" plastic sides and louver provide higher transmission of light; louver has a 45/45 degree cutoff so that lamps are not visible from normal viewing angles. There are eight 4-foot and two 8-foot luminaires, in two or four lamps. There are four lamp types: T-12 medium bi-pin, T-12 medium bi-pin instant-start, T-12 rapid-start and T-12 slimline. All units can operate on 110-125 volts, 60 cycle ac.

Mitchell Manufacturing Co., 2525 Clybourn Ave., Chicago, Ill.



Weatherproof Outlets (40)

New easy-to-install duplex weather-proof outlet, P&S No. 4530, designed for surface mounting. Box is of cast aluminum, plate and caps are of aluminum alloy. To install, a hole is drilled through siding or wall into basement or other accessible inside space. Cable is fed from inside house through rubber grommet into box where it is held by clamp. Provision is made for third wire ground where desired. Cover and plate gaskets and rubber grommet seal outlet against the elements. Approved by Underwriters' Laboratories. Literature is available.

Pass & Seymour, Inc., Syracuse 9, N. Y.

Outdoor Lighting Units (41)

A series of 12 lighting devices, known as the "Lytespace Series", for lighting outdoor space. The series includes six



GET THIS!

**THE NEW
CUTLER-HAMMER
UNIT BREAKER**

Modern Low-Cost Circuit Protection

The new Cutler-Hammer Unit Breaker—the Unit System Circuit Protector—has everything you want—low price, top convenience in stocking, in selecting proper circuit breaker capacities for a specific home or other buildings, rapid, easy installation and wall-switch snap-on, to restore service.

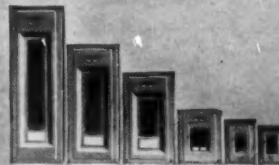
The Cutler-Hammer Unit Breaker is 3 simple components. The case with bus bar assembly. The individual circuit breaker in 15, 20, 30, 40 and 50 amp. capacities that the contractor just picks out and pushes in. And the cover for flush or surface mounting. 6 case sizes handle any circuit combination from 1 to 32 circuits. There are many other features too—plus *genuine Cutler-Hammer quality* at new low prices.

See this new Unit System Circuit Protector. Get the whole story including the new pocket size Handilog and selector charts. Don't delay. Cash in. Contractors, see your authorized Cutler-Hammer distributor *today*. CUTLER-HAMMER, Inc., 1306 W. St. Paul Avenue, Milwaukee 1, Wisconsin.



Basically 3 Components

The C-H Unit Breaker consists of case, individual circuit breakers, and cover. Easy to assemble, and install.



6 Cases—32 Circuits

Only 6 case sizes handle all needs to 32 circuits. Also rainlight and special types available.

Rock Bottom Prices Plus These Features

Ambient compensated. No pre-tripping in hot climates. Thermal magnetic protection against heavy overloads and shorts. Compact, rugged, lasting, dependable. Quick make and break for long contact life. Famous C-H Quality.



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DEPENDABILITY

HOLDING POWER

QUALITY

SERVICE

UNIFORMITY

TRADE ARRO MARK

All Signs Point to...

for ANCHORING & DRILLING DEVICES

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LAG SCREW EXPANSION SHIELD



A-C-E EXPANSION SHIELD



DOUBLE EXPANSION SHIELD



O-E EXPANSION SHIELD



MACHINE SCREW ANCHOR



STUD BOLT ANCHOR



LEAD SCREW ANCHOR



MAL-LEAD BOLT ANCHOR



TWO WING SPRING-TYPE TOGGLE BOLT



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FOUR-POINT HAND STAR DRILL



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 1540 Boone Ave., Marion, Ohio



spot or floodlights, four path or shrub lights and two terrace or patio lights. Fitted with ordinary flood or spot or regular incandescent bulbs, "Lytescapes" may be used to light driveways, breezeways, paths, steps, pools and terraces. With the exception of those units intended for direct and permanent installation, all "Lytescape" units are wired as lamps with 12-foot weatherproof electrical cord. They are available with a special "Add-a-Unit" cord set, which has a built-in watertight receptacle.

Lightolier, Inc., 346 Claremont Ave., Jersey City 5, N. J.



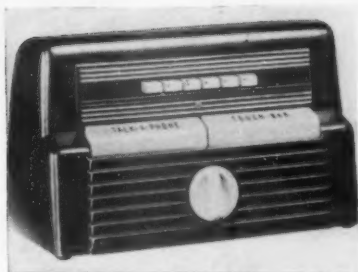
Lighting Fixture (42)

New opal sphere luminaires for medium and high ceilings. Hand-blown white opal glass spheres are available in four sizes: 10-in., 12-in., 14-in., and 16-in. The base and pendant are finished in a matte-gray baked-on-enamel. It is available in either a ceiling type or pendant type unit. The pendant units feature a patented "hang-straight" assembly which allows for a 52° latitude of swing for use on slanted ceilings.

Prescolite Manufacturing Corp., 2229 Fourth St., Berkeley 10, Calif.

Intercommunication System (43)

A six-station wireless selective master intercommunications system, LCM-8806. Features include a six-channel selector, which enables each unit in the system to transmit on any of the six separate channels and receive calls on any channel it selects to use. Three separate conversations can be carried on simultaneously over the system. Conference calls between



masters, as well as the original Talk-A-Phone Uni-Trans feature which provides for dictation, or one-way transmission without continued manual operation, are offered, as well as the exclusive "Sonic Gate" Circuit. The "Sonic Gate" suppresses line noises and hum while the system is in actual operation as well as when in stand-by position. LCM-8806 is adaptable for additional master units, starting with two masters. Unit plugs into conventional electric outlet.

Talk-A-Phone Co., 1512 S. Pulaski, Chicago, Ill.



Garden Lighting Equipment (44)

This outdoor indirect domelite is one of a series of six, particularly suitable for illuminating planting areas, patios, ponds, walks and play areas. The lamp is concealed in a cast aluminum housing with a porcelain heatproof socket and weather-proof gasket seal. Light is reflected up to the 14-in. or 18-in. diameter dome of high reflectance white. Fixtures are finished in black wrinkle finish with brass arms and made for permanent conduit installation or are available with cast aluminum ground spike with a weather-proof receptacle and cord and plug for portable use. Brochure is available.

Teal Corporation, 14 Cordier St., Irvington, N. J.

Emergency Light (45)

New heavy duty emergency light will provide automatic and instant illumination in all buildings where sudden power failure could have serious results, such as hospitals, movie houses, public buildings, office buildings, apartment houses, and garages. The nickel cadmium battery is guaranteed for 10 years. Fully automatic features include a built-in battery charger for both automatic trickle charging and 3-amp, switch-controlled charge-

Permanent Efficiency!

SILVERED-MIRRORED PERMAFLECTORS

UP TO DOUBLE the footcandles with standard lamps! That's the performance record of silver-mirrored Permaflectors. This amazing efficiency more than pays for the equipment cost in a short time... and continues to pay dividends in lower operating costs. Whatever the wattage, or the job—a Permaflector does it best!



1 Crystal glass, made in our own glass division, is clear, sparkling, uniform, flaw free.



2 A double plating of pure silver assures maximum light reflectivity.



3 A copper envelope over the pure silver provides lifetime protection for the silver.



4 A final silver-gray, satin finish gives added protection, blends with all interiors.

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404 OLIVER BUILDING, PITTSBURGH 22, PA.



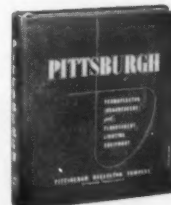
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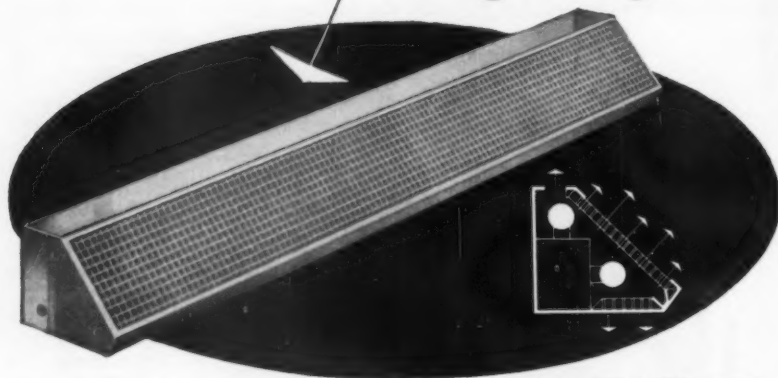
404 Oliver Building, Pittsburgh 22, Pa.

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(the 2-in-1 bracket) (TM Pat. Pend.)

An exciting new look. Sparkling-like a superb diamond! Classic beauty and workmanship in the Guth tradition. *It's the new fashion in Cove lighting made possible by GRATELITE: low brightness, high efficiency, excellent diffusion, low upkeep.*

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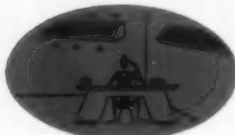
*U. S. & Can. Pat. Pend. TM Reg.



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beams 80% of light directly upward and outward!
beams 20% of light downward to brighten side walls!
perfect shielding in 45° x 90° zones by GrateLite!



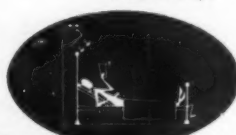
as luminous indirect cove



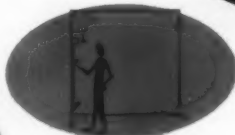
in fitting room



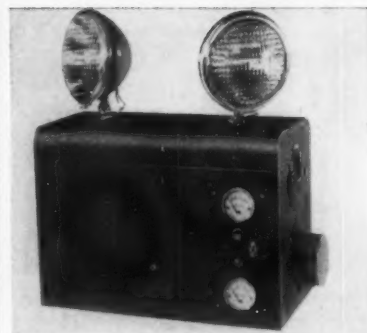
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over hospital bed



chalkboard downlite with cove



ing. Rate of trickle charge is indicated on a milliammeter and fast charge by an ammeter. Resistors control the two charging rates, and full wave rectification is provided. The heavy-duty lighting circuit transfer relay has $\frac{1}{4}$ -in. silver contacts, rated for 20 amps. Model PC-40 units are rated at 128 candlepower. No. 4013 sealed beam lamps are normally provided, but built-in chrome or floor reflectors and any combination of 6-volt lamps of 12, 21, 32 or 50 candlepower are available. Lighting heads may be mounted directly on unit or in a remote position.

Dual-Lite Co., 186 Front St., Bridgeport 6, Conn.



Cutout

(46)

A new indicating cutout, designated PIV (porcelain intermediate duty, vertical drop down) has been added to this line. It is rated 100 amperes, 5.2 kv, with interrupting capacities of 8000 amperes, at 2.5 kv and 5000 amperes at 5.2 kv. A drop down tube provides visual indication of cutout operation and disconnects the fuse tube from the circuit. The PIV box will accommodate the standard 50-ampere door and cartridge assemblies, the PID indicating 100-ampere door, and a 200-ampere, solid blade, disconnect switch door.

Line Material Co., 700 W. Michigan St., Milwaukee 1, Wis.

Induction Motors

(47)

Redesign of its line of large end-shield bearing synchronous and wound rotor induction motors of four and more poles, Types AB and ANY, has been announced. Modern in appearance, the mo-

The Right Answer

TO YOUR MOTOR CONTROL "Housing" PROBLEMS



ARROW-HART INDUSTRIAL-USE Enclosures (NEMA TYPE XII)

Developing this new line of NEMA XII Enclosures, Arrow-Hart worked in close cooperation with leading Industrial Engineers throughout the country. Their recommendations have helped us make these the finest enclosures ever offered for use in those industries where it is desired to exclude such materials as dust, lint, fibres and filings, or oil and coolant seepage. Teamed with Arrow-Hart Type "RA" Magnetic Motor Starters, they assure the superior electrical performance that will help all machines realize their full productive efficiency.

Features...

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- **REMOVABLE MOUNTING PLATE** . . . makes it easy to remove starter from enclosure by merely loosening 2 non-removable screws.

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- **COMBINATION STARTERS . . . SIZES 0, 1 and 2**

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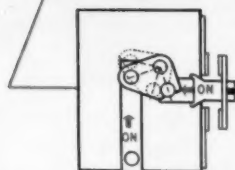
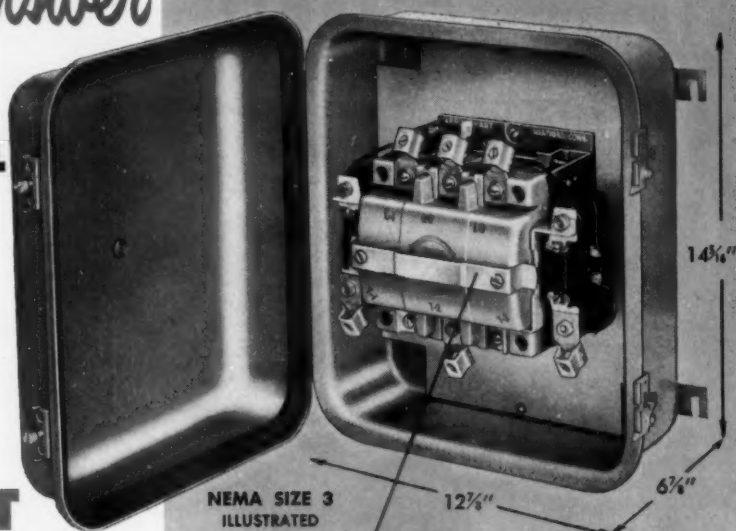
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FLOOR JUNCTION
BOXES

"Latrobe" Floor Boxes and Wiring Specialties are designed for quick, easy installation and superior performance. Stripped of frills and complex assembly, "Latrobe" Products do their job smoothly and economically. All adjustable boxes are now equipped with a positive bond which makes them completely fire proof.

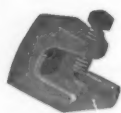
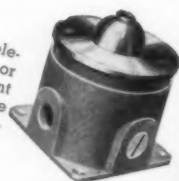


Non-Adjustable Floor Box

Represents the last word in unique design, neat appearance, fewest number of parts, and least amount of labor to install.

Adjustable Floor Box

Designed for telephone outlet or where permanent connections are made, or as a junction box.



Insulator Supports

Malleable iron clamps of high tensile strength. Four sizes to fit all standard porcelain or glass insulators.

Staples and Cable Clips

High quality staples or cable clips can be ordered in carrels.



Write for complete catalog and price list

UTILITY OUTLETS

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PIPE AND CONDUIT
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CABLE SUPPORTS

CABLE CLIPS

STAPLES

FISH WIRE

Fullman Manufacturing Co.

1209-1215 JEFFERSON STREET

LATROBE, PA.

tors' fabricated-steel stator yoke has been lengthened to accommodate slip rings and brush rigging with access openings of ample proportions for brush inspection and maintenance. Rotor or slip-ring leads are not exposed in the new design. Internal connections are made to an external rotor lead terminal box for conduit connection. Overhung exciter mounting on synchronous machines is accomplished by means of a split bracket secured to motor end shield. The new construction is inherently drip-proof and is available in splash-proof enclosure. Sleeve or anti-friction bearings can be utilized as required.

Allis-Chalmers Manufacturing Company, Milwaukee 1, Wis.

Floodlight

(48)

A new aluminum floodlight with thermal shock and impact resistant lens for 200- and 300-watt lamps. Reflector and neck of unit are spun of heavy gauge aluminum, in one piece streamlined design. Floodlight is furnished with heavy duty round base for mounting to any flat surface or directly to 4-inch outlet box. It is factory wired including cord and plug. Bulletin No. 128-54 is available.

Steele Manufacturing Co., Broadview, Ill.

Product Briefs

(49) A new butyl-molded miniature current transformer, featuring both window-type and bar-primary construction, has been announced by the General Electric Co., Schenectady, N. Y. . . . (50) International Register Co., Chicago, Ill., has developed a new "E-Z See" dial for Inter-Matic time switches.

(51) A new heavy-duty trenching machine for pipelines and similar heavy construction jobs, Model 240, has been introduced by the Cleveland Trencher Company, Cleveland, Ohio. . . . (52) A new and improved carbon brush design has been announced by the Helwig Carbon Products Co., Milwaukee, Wis. . . . (53) The Electric Controller & Manufacturing Co., Cleveland, Ohio, has announced the availability of a line of small electro-magnets to be used with mobile materials handling systems.

(54) John A. Roebling's Sons Corp., Trenton, N. J., has announced that they are now in full commercial production of tellurium alloy lead-sheath cable. . . . (55) A new selenium rectifier with an inverse cell rating of 40 volts has been announced by Vickers Electric Division, Vickers, Inc., St. Louis, Mo. . . . (56) Technical Devices Company, Los Angeles, Calif., has introduced a new semi-automatic wire cutter and stripper, designated "Mark I".

(57) A gadget called "executive priority" has been incorporated into the new Flexifone intercommunicating sys-

tem just placed on the market by the DuKane Corporation, St. Charles, Ill. It gives the boss the power to talk right through a busy signal. . . . (58) Keystone Manufacturing Co., Center Line, Mich., has introduced a new oil burner cutout box, which meets code requirements for separate fusing. . . . (59) Ohio Brass Company, Mansfield, Ohio, has introduced a new valve-type Thorex lightning arrester for the protection of equipment with low impulse insulation strengths.

(60) A new cutter for BX armored cable has been announced by Telkor, Inc., Elyria, Ohio. . . . (61) A new wide range, multipurpose insulation tester has been developed by Associated Research Inc., Chicago, Ill. . . . (62) New adjustable torque-limiter-coupling units that provide overload protection for a wide variety of machinery drives with direct-connected shafts are now available from Morse Chain Company, Detroit, Mich.

(63) A new electric dehumidifier that heats as well as dries has been introduced by the Mitchell Manufacturing Co., Chicago, Ill. . . . (64) A new safety adjustable clamp made by the Safety-Adjustable-Hold-Down Clamp Company, 600 Albany St., Brunswick, Ga. . . . (65) Jasper Blackburn Corporation, St. Louis, Mo., has announced the manufacture of new sectional copper bonded ground rods.

(66) Ebert Electronics Corp., Queens Village, L. I., N. Y., has improved its single pole mercury plunger relay. . . .

(67) Bi-Glas, a new high-temperature electrical insulating material, has been introduced by the Electro-Technical Products Division of Sun Chemical Corporation, Nutley, N. J. . . . (68) Probe fittings Series 67 is designed for use with standard Photoswitch level controls made by Photoswitch Incorporated, Cambridge, Mass.

(69) A new pedestal fan for use in industrial plants and commercial establishments has been announced by Chelsea Fan & Blower Co., Inc., Plainfield, N. J. . . . (70) A new solenoid valve of stainless steel for high pressures has been introduced by Atkomatic Valve Company, Indianapolis, Ind. . . . (71) A new tool, called Stripex, that will slit sheathing, strip wire, and cut wire or sheathing. It is made by Burbank Electrical Products, Burbank, Calif.

(72) The Jasper Blackburn Corp., St. Louis, Mo. is now manufacturing a new cross tap clamp for joining different combinations of cable sizes. . . . (73) Single and double flange-type heaters have been added to the Calrod immersion heater line produced by General Electric Co., Schenectady, N. Y. . . . (74) For wattage sizes 4 through 20, the Stratfield Co., Bridgeport, Conn., offers a fluorescent light ballast measuring 2½-in. by 1½-in. by 1⅞-in.

(75) A new series of Type M line traps is available from the Westinghouse Electric Corp., Pittsburgh, Pa.

PROOF of HOLDING POWER . . .



RAILROAD ELECTRICIAN SAYS:

"I am sending you a sample (see photo above) of what they (Rawlplugs) are capable of doing . . . We were removing some old conduit from an outside wall and this piece of brick was pried off with the 1" conduit used as a lever.

I cannot remember how long these plugs had been installed, but believe it to be between twenty and thirty years."

J. G. COLWALL, Montgomery, Alabama

When you require maximum holding power and the least drilling time (you drill smaller holes) use Rawlplugs.

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Request samples by attaching coupon below to your business letterhead.

MARK ☒ for the products you have used.

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☐ RAWLPLUGS: Universal screw anchor for any material. The original fibre plug for wood and lag screws.

☐ RAWL-DRIVES: Drives like a nail into a drilled hole. Holds like a bolt. Use only in hard materials.

☐ RAWL-TAPERS: A machine screw anchor that fits the hole drilled either by a new or worn drill.

☐ RAWL TOGGLE-BOLTS: For anchoring any fixture or utility in hollow walls or ceilings.

☐ RAWL CARBIDE DRILLS: Spiral precision tool for rotary drill or hand brace. Sizes ⅜" to 1½".

☐ RAWL HAMMER-SETS: Heavy duty threaded type machine bolt anchor.

☐ RAWL-ANCHORS: For holding bolts permanently in materials such as concrete, marble, stone, brick, etc. Heavy duty type.

☐ RAWLDRILLS: For drilling holes in all masonry. Easily sharpened. For hand and power drilling.

☐ DIMENSIONAL CHART of above products

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THE RAWLPLUG COMPANY, Inc.

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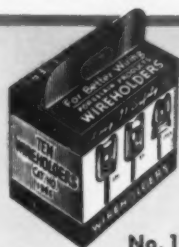
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Wireholder Merchandising Pack



Porcelain Products' wireholders *sell* because they're pace-setters. They're dependable—rugged . . . and packaged in a carton that is convenient to handle. It's practical—handy.

Porcelain Products' wireholders and secondary service materials have been known as *Quality Products* for years because of their strong, sturdy construction. Metal reinforced wireholders are designed with metal in tension, porcelain in compression—hot-dip galvanized steel parts. All wireholders have sharp, fast driving screw threads—large pulley-action wire holes—and many more features.

Porcelain Products' wireholders give you more value for your dollar—greater customer satisfaction. See your distributor.



**60
years**

ELECTRICAL PORCELAIN SINCE 1894

Porcelain Products, Inc.

FINDLAY, OHIO

**PP
INC.**

CATALOGS and BULLETINS

(76) **SCHOOL LIGHTING FIXTURE** has 45° by 45° shielding and is available in 2-lt, 40-watt, 21-lt, 40-watt tandem and 2-lt, 75-watt units with metal or plastic side panels; designated the MP-45. Gibson Mfg. Co.

(77) **POSTS AND LANTERNS** of aluminum. 10-page catalog illustrates the complete interchangeable line. Hadco Aluminum Products Co.

(78) **HEAT PUMPS** utilizing water as the exchange medium are named Flow-Temp. Six reversible models are available for heating and cooling and an additional six units for heating only. Designed for commercial installations as well as homes. 4-page bulletin FT-50-A. Acme Industries, Inc.

(79) **EXHAUST FANS** for wall mounting or penthouses. Units are of axial flow direct-connected type. Bulletin 500, 8 pages, gives complete dimensional and application data including information on the portable "Man-cooler" blower. M & E Mfg. Co.

(80) **FLUORESCENT FIXTURE** for ceiling mounting features high quality illumination and excellent sound control qualities. 8 models. Sheet C-17, 8. Sylvania Electric Products, Inc.

(81) **ALUMINUM LADDERS** and platforms, also scaffold planks weighing 2.7 lbs per sq ft and swing stages weighing 3.2 lbs per sq ft. 16-page catalog 54. Louisville Ladder Co.

(82) **STORAGE BATTERIES** of Nickel-Iron-Alkaline construction, designed for electrical trucks. 20-page booklet provides electrical data, weights and dimensions and describes operating principle of this type of battery. Thomas A. Edison, Inc.

(83) **ADJUSTABLE SPEED DRIVES** for fractional hp motor applications are an integral combination of ac constant-speed induction motors, eddy-current couplings, and electronic speed controls. 8-page bulletin FAS covers capacity of available units, construction features, control and operations. Eaton Mfg Co.

(84) **CABLE TRAYS** for supporting overhead and vertical cable runs come in stock sizes of 6-, 12-, 18- and 24-in width with a variety of fittings for changes of level or direction. 10-page catalog. Fab-Weld Corporation.

(85) **SOLVENT SAFETY.** Selecting the right solvent for the job is simplified by use of seven rules for measuring

solvent qualities. 4 pages. John B. Moore Corp.

(86) NAMEPLATE of etched metal and enamel has the ease of application of a decal, will permanently adhere to any smooth, clean surface. 4-page folder. Miller Dial & Name Plate Co.

(87) ELECTRONIC REGULATOR for speed, voltage, and current (tension) control of industrial motor drives, called VSR Sealpak. 2-page bulletin K-2076. Reliance Electric & Engineering Co.

(88) OUTDOOR LIGHTING. Two bulletins. 128-54, 4 pages, covers small and medium floodlights from 100 to 1500 watts. 122-54, also 4 pages, describes haymow lighting units and yard lights particularly suitable to farms. Steber Manufacturing Co.

(89) SWITCHES for industrial control. 20-page catalog 101 describes 22 basic types with characteristics, ratings and technical data. Micro Switch.

(90) PRODUCTIVE MAINTENANCE offers five steps for organizing the electrical maintenance department to meet the demands of automation. Bulletin GEA-6087, 18 pages. General Electric Co.

(91) BOX SUPPORTS for "dry wall" installation of switch boxes. Sheet TNI-654. Appleton Electric Co.,

(92) INSULATING MATERIALS of all types used in repair and maintenance shops are concisely listed in 32-page catalog 16 which includes descriptive information, prices and ordering data. Insulation Manufacturers Corp.

(93) ANCHORING DEVICES for fastening to plaster, stone, brick, wood or concrete. 12-page catalog gives complete dimensional data and prices, also describes drill and hammer equipment. Rawlplug Co.

(94) INDUSTRIAL LIGHTING UNITS of high and low bay types feature silver-mirrored Permafectors, both in the single element construction and in the dual, incandescent and mercury-vapor units. Exterior flood and spotlights up to 1000 watts in size are also described. Pittsburgh Reflector Co.

(95) POWER TRANSFORMERS, ranging from 501 to 10,000 kva, have been standardized to afford lower costs and more rapid delivery. Booklet GEA-6108, 40 pages, describes single- and three-phase transformers of 69 kv and below. Prices and descriptions of optional features are included. General Electric Co.

(96) RLM SPECIFICATIONS BOOK for 1954 features the inclusion of data on "upward component" industrial lighting units as well as latest revisions. RLM Standards Institute.

ANNOUNCING THE NEW

HUBBELL

20 amp.

AC

alternating current

Topper Switch

Now available in both 15 and 20-amp. ratings.

20 Amperes
120-277 volts
Catalog No. 1221



ONLY HUBBELL TOPPER SWITCHES COMBINE ALL THESE FEATURES

- Shallow size
Topper switches are shallower—take up less room
- Quiet operation (without mercury)
- Large, fine silver contacts
- Operates in any position
- Upset binding screws
- Long life at full rated loads
- Back and side wiring utility
- Convenient strip gage
- Easy-to-find back wiring entry holes

See Your Electrical Distributor.



Meets the need for a quiet, yet dependable, long-life AC switch to withstand the inductive load characteristics of fluorescent systems.

QUIET operation

Note red top for easy identification of Topper 20-amp.

A Switch Designed for the Purpose

... to control large inductive circuits at full rated capacity. This means that amp. for amp. Topper controls more fluorescent fixtures than outmoded switches. It also means that larger areas can be controlled with one switch, and that heavier circuits can be run and fewer of them, resulting in lower material and labor costs.

Write today for free Topper folder.

TOPPER AC SWITCHES		
	15-AMP.	20-AMP.
S P single pole	1201	1221
D P double pole	1202	1222
3 W 3-way	1203	1223
4 W 4-way	1204	1224

Available in brown and ivory.



HARVEY HUBBELL, Inc.

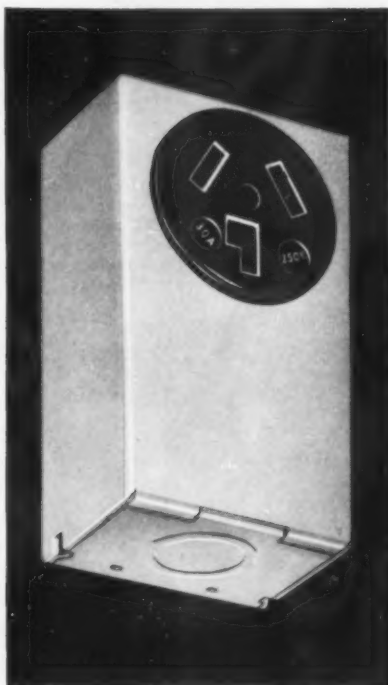
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BRIDGEPORT, CONNECTICUT

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NEW!

BRYANT 3-WIRE, 30 AMP. POWER OUTLETS

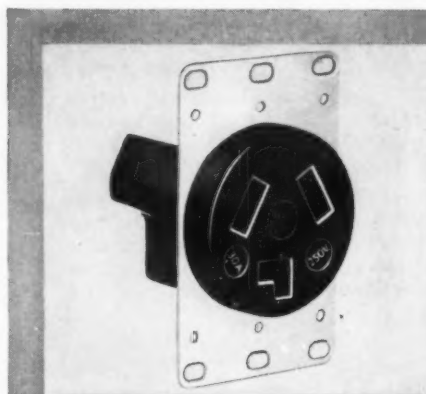


These new outlets have clamp type pressure terminals for faster, more secure connections. They are especially recommended for electric dryer installations.

NO. 9304 SURFACE MOUNTING OUTLET

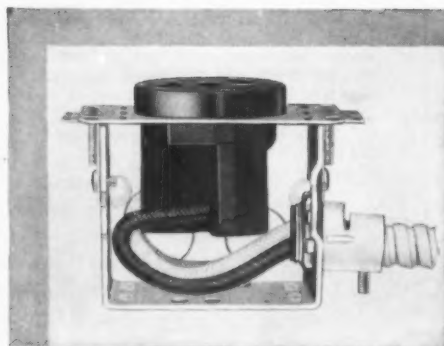
No. 9304 in attractive aluminum enclosure, blends with metal kitchen and laundry equipment. Heavy gage aluminum makes a near-indestructible device. Stainless steel plates available in one and two gangs — each with single opening.

Nos. 9339 and 9339-B all-rubber cord sets have non-removable rubber caps and strain relief cable clamps.



NO. 9303 FLUSH MOUNTING OUTLET

No. 9303 is the only device of its type that can be mounted in a single gang box. It can also be mounted in 4 or 4-1/16 inch square boxes with plaster cover raised 1/2 inch or more.



HOW TO MOUNT NO. 9303 IN SINGLE GANG BOX

1. Box connector for armored or non-metallic cable must be used.
2. Conductors (about 5-5 1/2 inches long) should be stripped 1/2 inch — use handy strip gage.
3. Insert stripped wire ends under terminal plates — tighten screws.
4. Position in box, as shown at left.

Listed by Underwriters' Laboratories, Inc.

Specify Bryant
from your
Electrical Distributor



THE BRYANT ELECTRIC COMPANY

Bridgeport 2, Connecticut

Chicago • Los Angeles

J-99908

Reader's Quiz

Dairy Barn Ventilators

QUESTION C26—We have two dairy barn ventilators as follows: $\frac{1}{2}$ hp, 115 volts, 2.5 amps, 60 cycle and 1725 rpm speed, which exhaust the barn too rapidly, causing very low temperatures in the building. As a result, the fans are not used and now we have excessive moisture.

How can I reduce the speed of these motors so that they will move less air?—G.M.D.

ANSWER TO C26—While the question does not include sufficient information as to the type of $\frac{1}{2}$ -hp motor used on the fans, it is unlikely that the speed can be changed with satisfactory results. Our 20 years of experience in this field shows conclusively that variable or multispeed motors are not practical in dairy stables.

If the installation is in a southern area, the installation of a thermostat in the motor circuit would help to control the stable temperature but this would not provide continuous ventilation.

We favor the two-fan system with a thermostat on one unit and continuous operation of the other unit. The continuous-operating fan must not deliver over 35 to 40 cfm per 1000 pounds of animal weight or the stable will then be too cold in northern climate.

For single fan installations, we find the motor-operated shutter controlled by a thermostat provides an economical unit. Several hundred installations in New York State are doing a fine job. This two-volume shutter controlled system was developed at Cornell and equipment is now manufactured by at least four manufacturers.—C.N.T.

Transformers Connected Delta-Delta

QUESTION D26—If three transformers with different impedances are hooked delta-delta, what would cause a circulating current? Is it the difference in voltage, the difference in impedance or a combination of both?—M.D.

ANSWER TO D26—Circulating currents are produced in the delta-delta

transformer bank when an unbalance in voltage exists in the delta. This unbalance in voltage results in a voltage which is the driving source for the circulating current. The circulating current is a single-phase current flowing in both the primary and the secondary windings of the delta. The value of the circulating current is limited by the impedance of the three transformers in series.

The voltage which produces the circulating current appears when there is a ratio difference between the three single-phase transformers making up the delta-delta bank. The ratio differences occur due to variations of impedance between the transformers, either they have different design impedances or the impedance is different due to the transformers being operated on different tap positions.

The circulating current magnitude is not detectable by line current measurements. To obtain its magnitude, a current reading must be taken in the delta. Small differences in ratio between transformer can produce sizable circulating currents; if the transformer is carrying a near full load, the transformer will be considerably overheated and possibly damaged.—R.L.S.

ANSWER TO D26—In our studies about delta-connected transformers we find that the reason that we do not get a short is because the third transformer has the same voltage as the open delta connected to it, but of opposite polarity. We will get circulating currents if the voltage is wrong at any spot between no load and full load. The cause can be an unbalanced load on the primary or secondary side of the transformer, in the transformer, or a combination of the three reasons.—H.S.

Relays And Their Calibration

QUESTION E26—Which overload relays lose their calibration sooner, the bimetallic, the oil dashpot or the solder type?—H.S.

ANSWER TO E26—We prefer the heavy duty bimetallic type, and, while we have never checked the exact calibration, we have found it will protect

against single-phasing, overloads and low voltages where a solder type will frequently fail to open before a stator is damaged.

We found that the solder type is especially undependable against low voltage and single phasing, and as we have a number of 32-hp, 3-phase, 220-volt motors which are connected to various receptacles through portable cables, this is the type protection we most frequently need. The bimetallic overload meets these requirements.

We also discovered that some electricians will attempt to repair a defective solder type overload by resoldering it. Since the calibration will depend upon the type and amount of solder, such repairs make the overload useless, and give a false sense of protection.—D.H.N.

ANSWER TO E26—The bimetallic, oil dashpot and solder type overload relays are all dependent on temperature to a greater or lesser degree for their calibration retentivity. Aging of the relays also affects their calibration. However, the particular use to which the relays are adapted will affect their calibration considerably.

The fuse solder type relay has very good calibration but is very costly in that it must be replaced constantly unless repeater fuses are used. There are rating and temperature restrictions in this type of relay. This relay is very good for short circuit conditions but employs a long time lag on any overload.

The bimetallic relay is very good considering the calibration of the two metals used. However, under actual conditions there is an uncertainty of time delay due to the temperature rise needed to operate, unless the relay can be calibrated under these actual conditions and maintained for that particular application. Then a change in the ambient temperature will affect the calibration somewhat.

The oil dashpot relay is reliable in operation but poor in calibration since the viscosity of the oil changes with temperature changes. Therefore the viscosity of the oil affects the tripping time. This feature also applies to bimetallic relays which are enclosed in oil. As a more reliable overload relay, the induction disc overload relay has given very satisfactory performances.—J.B.K.

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Certified **60**

tops every class!

**you know what
you are getting...**

On every carton and reel of Bronco 60
Certified cord or cable is a certificate
attesting that the protecting jacket of the
cord or cable therein contains not less
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**60% NEOPRENE
by weight**

CERTIFIED — 60% NEOPRENE BY WEIGHT

**Why
take
less
than
60%
Neoprene
by weight?**

Proof of contents is branded into the
jacket every two feet — "BRONCO
60 CERTIFIED — 60% NEOPRENE
BY WEIGHT..." followed by the
type, size, number of conductors,
rated voltage, and "F116RM" — U. S.
and Pennsylvania Bureau of Mines
approval number.

SOLD NATIONALLY BY ELECTRICAL WHOLESALE DISTRIBUTORS

Manufactured by WESTERN INSULATED WIRE CO., Los Angeles 20 • California

Testing Motors For Shorted Fields

QUESTION F26— Is there some method, besides the comparison ohmmeter way, of testing for shorts in fields of series motors used in drills and saws?—H.G.C.

ANSWER TO F26—There are a couple of methods I know that I always use. First use a six-volt storage battery, energize fields, and take drop reading with a low-reading voltmeter. Put meter leads C & D for one reading, reverse leads then D & E for other reading. Both readings should read the same to be right. Method two, energize fields with storage battery then use a piece of steel to test magnetic pull of each pole or field, the weak field, will be the bad field.—J.J.A.

ANSWER TO F26—Another method is to use a low reading voltmeter and a low voltage source. This source could be an ordinary dry cell if you have a voltmeter which gives a large deflection at 1.5 volts. By comparing readings across each field coil, you can quickly tell which one is short circuited. Use a good dry cell. If you have an ammeter, it can be placed in circuit to check on current consistency.—E.B.

ANSWER TO F26—H. G. C. could pass an ac current of approximately the full load current of the device through the field coils in series and compare the voltage drops across the field coils with a low reading voltmeter. A low reading would indicate a defective coil.—B.C.M.

Fluorescent Lamps At Low Temperatures

QUESTION G26—In an outdoor installation of 40-watt, 48-in., T-12 fluorescent lamps for area lighting at a drive-in diner, the fixtures are mounted under the eaves of the roof. This installation was made last summer and has operated successfully until the recent cold spell, when it was observed that during periods of temperature in the range of 30° to 10°F the light output fell off markedly and a shadow seemed to spiral down the tube. There was considerable difficulty in starting the lamps at this temperature, and below 10° the lamps would not function.

Can some one explain this phenomena and suggest a possible remedy?—L.D.B.

ANSWER TO G26—It is an inherent characteristic of fluorescent lamps to

show a considerable decrease in light output at low temperatures. However, if a tightly enclosed fixture of relatively small volume is used, the light output of 40-watt, 48 inch, T-12 fluorescent lamps can be maintained at a rather high value at temperatures of 30° to 10°F. The light output is dependent on the bulb wall temperature. This is a matter of change in mercury pressure in the tube and its reduced effect in activating the phosphor rather than a change in the phosphors.

The light output also decreases at high temperatures. Generally speaking, the maximum output is obtained with a bare lamp at about 70° to 80° F so that with most enclosed units, the maximum output is obtained at lower surrounding temperatures, possibly in the order of 50°F.

The 40-watt lamps can be started satisfactorily with glow-switch starters as low as freezing temperatures. For installations subjected to lower temperatures, thermal type starters or manually operated starters will start lamps as low as 0°F. Low temperature 40-watt F lamps are also available and can be used with glow-switch starters at temperatures as low as 0°F. Low temperature 40-watt F lamps are designed to provide proper operation and rated light output with standard ballasts. However, the life of low temperature lamps is somewhat shorter than the standard general line fluorescent lamps.—L.R.K.

ANSWER TO G26—Failure of fluorescent lamps at the temperatures you describe is not at all uncommon, and it does present a problem which sometimes means installing a new system of fixtures. At low temperatures, the vapor fails to carry an arc between the ends of a bulb at the instant when the starter disconnects the two filaments. The starter then returns to the starting position by re-connecting the filaments. This action will sometimes continue indefinitely. Some improvement and possible correction can be obtained by using other equipment. The best solution to the problem is to recess the fixtures and cut some glass to cover the opening, making the units fit flush. Small openings can be made to allow passage of heat from the inside of the building to the fixtures.—M. C. T.

ANSWER TO G26—Fluorescent lamps of the 40-watt, 48-in, T12 standard pre-heat type will not operate at low temperatures. About the only thing that can be done is to enclose the lamps in glass or plastic tubing to act as a heat insulator to maintain the necessary lamp operating temperature.—H.H.S.

For Trouble-Free Conduit Threading...it's a 65R

RIDGE



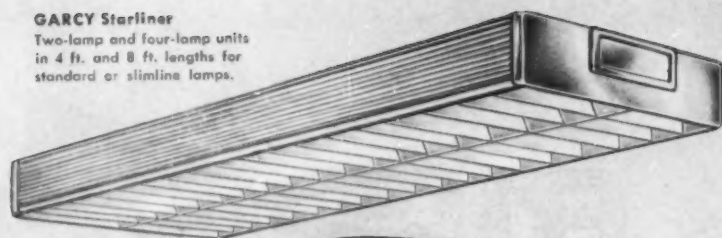
**This 65R threads
1" to 2" conduit with 1 set of dies
...and it won't jam!**

You won't find a die stock to equal this popular 65R—anywhere! It saves time—one set of self-contained high-speed dies adjust to 1", 1¼", 1½" or 2" pipe or conduit in 10 seconds! Mistake-proof self-centering workholder sets to size instantly! It saves trouble—lead screw won't jam, it kicks out automatically when standard length thread is cut. Clean perfect threads, *fast!* For trouble-free extra-easy threading buy 65R at your Supply House.

THE RIDGE TOOL COMPANY • ELYRIA, OHIO, U. S. A.



GARCY Starliner
Two-lamp and four-lamp units
in 4 ft. and 8 ft. lengths for
standard or slimline lamps.



I LIKE
ITS LOOKS

I LIKE
ITS EFFICIENCY

I LIKE
ITS EASY
MAINTENANCE

I LIKE
ITS EASY
INSTALLATION

I LIKE
ITS LONG LIFE



it's **GARC Y**
for "I" appeal

Garcy, by design, looks out for everyone's interests...wins the approval of all who have a choice in specifying, installing, maintaining and paying for lighting fixtures.

Consider the Garcy Starliner. Slim, trim and functional, this fixture has captured the fancy of architects and designers. It can be surface mounted to create the impression of built-in lighting...at a fraction of the cost. That's good for the man who pays the bill. He'll also like its long-life construction details...protective metal rails for the Alba-lite glass side panels, Garlite enamel that stands up like the finish on your car, louver cross-fins that are held under spring tension to prevent looseness, rattle or "sing."

Ask any mechanic who has worked with the Garcy Adjustable Stem Hanger. He'll tell you what a time-saver it is...especially where there are ceiling obstructions or slopes. Ask any maintenance man about the convenience of re-lamping two Starliner fixtures from a single ladder position. For all concerned, Garcy means "Quality...by design." Send for complete data sheets.

GARC Y

Quality by Design

Garden City Plating & Mfg. Co., 1730 N. Ashland Ave., Chicago 22, Ill.

In Canada: Garcy Co. of Canada, Ltd., 191 Niagara St., Toronto

Can you ANSWER these QUESTIONS?

QUESTION S26—Recently I was called to check trouble on an electric welder, the motor of which was three-phase, 440-volt. It was not carrying the load and then it would blow a fuse. I finally found that in the cable leads to the motor, the green wire was connected on one end to the ground properly but on the other end it was a phase wire.

This machine had been operating properly for over a year carrying its heavy rated loads many times while used in heavy-duty work. The question is, why did the trouble develop after all this time? There was no breakdown of any coils, etc.—C.S.S.

QUESTION T26—It is known that a condenser blocks out dc but allows ac to flow through. Our problem is just the reverse. We have an automatic 3-pole throw-over switch that is used for selective switching to keep 110 volts ac out of the 115-volt dc 3-phase motor. In the control circuit it becomes necessary to block out 220 volts ac from entering the 114-volt dc coil during the transition period.

If there is such a checkvalve, can some reader describe how to go about making one or to figure out what is needed and where to purchase it? The coil load or current is approximately 1 ampere at 115 volts dc.—L.G.D.

QUESTION U26—All transformer manufacturers have compiled printed tabulations showing allowable overloading peaks. We have a number of units that have consistently operated within these published figures. Do any readers have their own formula for overloading transformers, especially with excess loadings over the manufacturer's listing which have been satisfactory?—L.W.F.

QUESTION V26—Has anyone successfully constructed ac motors of the series, shunt and compound types by using rectifiers and filters to get dc for the fields, and letting the armatures remain ac? These ac motors might have the advantages of dc motors without the disadvantage of commutators. How feasible are these motors? What are the obstacles to their construction? What would their characteristics be?—E.B.

PLEASE SEND IN

YOUR ANSWER BY SEPTEMBER 15



PRODUCTION LINE TESTING FOR REGULATING ACTION: Here a Sola Constant Wattage Ballast for rapid-start lamps is being tested by varying primary voltage input from 106-130v. Light output must vary less than $\pm 2\%$ of rated value. The last two micro-

ammeters on the right of the upper row measure the light variation recorded by a photoelectric cell exposed to the lamps mounted on the back of the test board. This is one of several rigorous quality control checks made on these ballasts.

Sola rapid-start ballasts maintain lumen output $\pm 2\%$ constant with line voltage variations of 20%

If you purchase, specify, install or manufacture fluorescent lighting equipment, you can eliminate the undesirable effects of line voltage fluctuations through use of constant wattage ballasts. Even the best engineered fluorescent lighting fixtures cannot deliver their rated lumen output in the face of adverse voltage conditions, when operating from non-regulating ballasts.

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output within $\pm 2\%$ regardless of line voltage variations from 106-130v.

The Sola Constant Wattage Ballast Circuit also results in other important benefits: 300v from lamp to starting aid for positive starting . . . peak/rms ratio of approx. 1.5 @ 118v with excellent wave shape for long lamp life . . . cool operation . . . self-protection against damaging heat rise when lamps fail . . . absolute safety when relamping.

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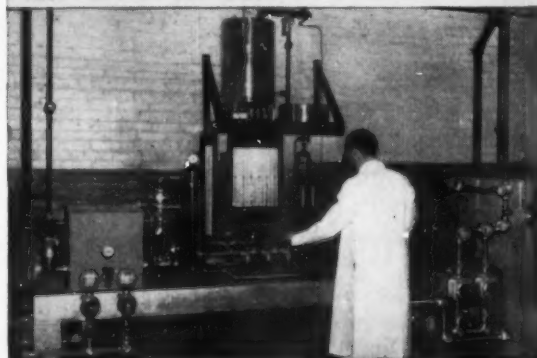
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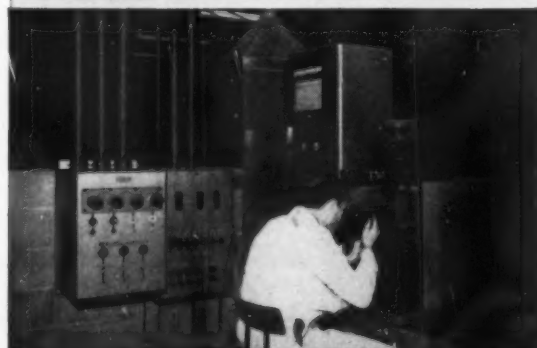
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Questions on the Code

Answered by

B. A. McDONALD, *New York Board of Fire Underwriters, Rochester, N. Y.*

GLENN ROWELL. *Electrical Engineer, Fire Underwriters Inspection Bureau, Minneapolis, Minn.*

B. Z. SEGALL, Consulting Electrical Engineer, New Orleans, La.

Portables Connected To Busway

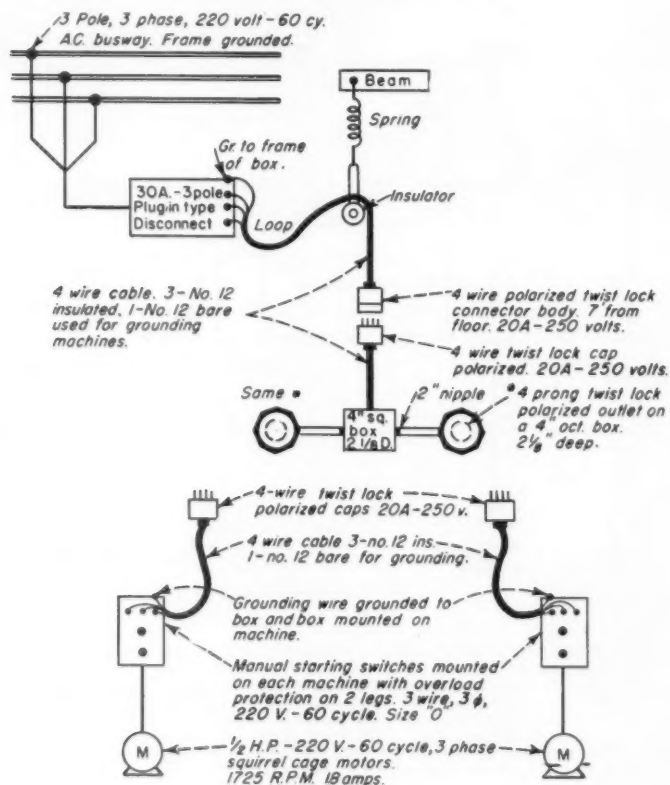
Q. Does the diagram below conform with the Code?—R.C.

A. The principal thing that I note on your diagram is the abnormal use of cord and the number of receptacles used to make a connection between the busway and the motor and its controller. Section 3646 of the Code permits branches from a busway to be made with suitable cord assemblies approved for hard usage for portable equipment or for the connection of stationary equipment to facilitate their interchange. Section 4003 also recognizes the use of cord for the connection of portable appliances but prohibits its use as a substitute for fixed wiring when the latter may be used. In the absence of definite

information in this regard, I assume that each machine is portable and its motor and controller are mounted on the machine. Such a combination could be connected by the use of a cord but each machine should have, in my opinion, a separate cord run to either a pendant of fixed receptacle or separate bus plug connectors. If the assembly consisting of the 4-in. square box with 2-in. nipples to the 4-in. octagon boxes is also portable, I believe you have exceeded the intent of Code requirements with respect to outlet box and cord use. Section 3707 requires boxes to be securely fastened in place. If it is fixed, there appears to be no occasion for using cord and an approved wiring method should be used between the assembly and the busway. Personally, I am inclined to believe that cords are necessary evils, and their use should be eliminated where it is practicable.

As covered by Section 3646 the cord must be approved for hard usage such as "busdrop cable" and according to Section 4009 shall be so connected to devices and fittings that tension will not be transmitted to joints or terminal screws. It is quite possible that a tension spring would be required at the terminal connection of the cord to the plug-in disconnect, to achieve this end. Another consideration could concern cord wear at the spring suspended insulator. The arrangement shown indicates cord movement at this point. Provisions for grounding appear to satisfy requirements. In order to properly protect the cord and the motor, it would be necessary to install a 15-ampere fuse in the plug-in device. Assuming that the occupancy involved is not special, I believe these comments cover the significant features involved with this installation.

—B.A.McD.



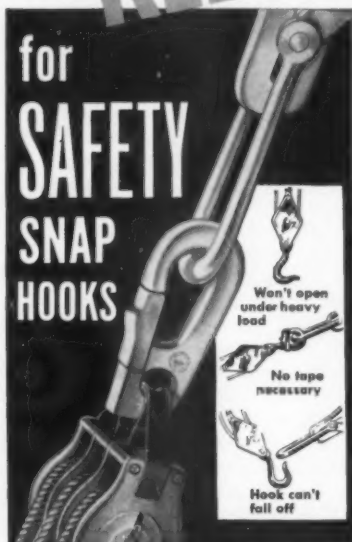
Wiring in House Trailers

Q. When a house trailer is converted to a permanent residence by the removal of the running gear and the location of the trailer on a regular foundation, may I, as the electrical inspector, insist on the complete rewiring of the trailer?—J.P.

A. While this is not strictly a Code problem, it is a serious problem with many municipal inspectors when they find themselves confronted with some of the poor wiring installations made in some manufacturers' trailers. One inspector has come up with a rather happy solution to this problem and that is to **require the rewiring of** the trailer or to accept the wiring as installed provided the owner or occupant will obtain a conversion unit to reduce the voltage to 6 or 12 volts for the wiring within the trailer. Conversion units of this type consisting of a transformer and dry plate rectifier are produced primarily for use on board small boats while at dock and can just as well be used for supplying energy to house trailers.

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Squirrel Cage Motor Installation

A. In order to clarify the problem, as I understand it, I have made a sketch showing the motor installation in question. I have also shown the

Motor Branch-Circuit Fuse. Section 4342 covers this point, which is answered by Tables 26 and 27 of Chapter 10. Table 26 covers motors marked with a Code letter which indicates the current inrush during the starting period. Table 27 covers motors that do not have Code letters. I have assumed that all of the motors in question bear Code letters F to V or that they have no Code letter and are full voltage starting. As a result a fuse protecting the motor branch circuit may be 300% of the full load current rating of the motor, which in the case of the 5 hp motor would be $300\% \times 15 \text{ A} = 45 \text{ Amps}$. If fuses are used, Section 4346 requires the fuse holder to be of a size not smaller than that required to accommodate the fuses specified by Table 20. Column 7 of this table specifies a 45-ampere fuse so a 60-ampere block must be used. It is interesting to note however that if the motor in question was of the high reactance type, a 30-ampere fuse

The diagram illustrates a 100 amp service entrance system. A main feeder (No. 8 wire) enters from the top left, passing through a 100 amp fuse block. This feeder splits into two main branches, each protected by a 50 amp fuse block. The left branch (No. 6 wire) serves two circuits: a 10 H.P. motor (27 Amps) and a 1.5 H.P. motor (5 Amps). The right branch (No. 12 wire) serves three circuits: a 5 H.P. motor (15 Amps), a 1.5 H.P. motor (5 Amps), and a 5 H.P. motor (15 Amps). Each circuit includes an O.P. (Overhead Protection) device and a Con. (Control) device. The diagram also shows a 30A block with a 15A fuse and a 4402-b Gen. use sw. (General use switch) for the 1.5 H.P. motor on the right.

- 2 Motor branch circuit fuse. Sec. 4341-4349. 300% x 27 amps = 81 amps.
3 Motor and controller disconnect. Sec. 4401-4411. Rated 10 H.P.
4 Motor running overcurrent device. Sec. 4321-4333. 125% x 27A = 34 amps.
5 Motor controller. Sec. 4381-4390 10 H.P. rating.
6 Motor 10 H.P. Sq. cage induction. 220 volts - 27 amps.
6 Motor br. circuit conductors. Sec. 4312 125% x 27A = 34A. No. 8 wire.
7 Size of feeder fuse. Sec. 4362. $81A + 15A + 5A + 5A = 106$ amps. Fuse.
8 Size of feeder. Sec. 4314. $27A \times 125\% = 34 + 15 + 5 + 5 = 59$ amps. No. 4-R

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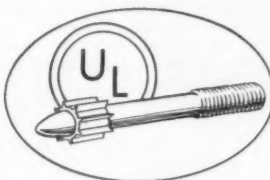


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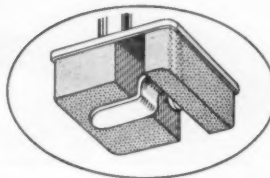


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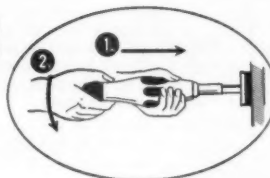
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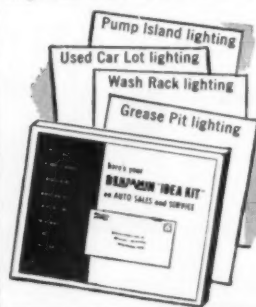


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and block could be used. (See Column 9). There is an exception to this general rule: when fuses having time delay characteristics are used, which permits the use of fuse holders of smaller size.

Motor Branch Circuit Conductors. Section 4312 covers this point. In general the conductors must have a carrying capacity not less than 125% of the motor full-load current rating. In the case of the 5 hp motor this would result in $125\% \times 15$ amps which equals 19 amperes and recognizes No. 12 conductors. It is important to note in the fine print note preceding Table 20 that the full-load current rating of the motors taken from Tables 21-24 must be used even though they may vary with actual nameplate ratings. There also are exceptions to this rule for the type of duty involved with the operation of the motor.

Motor Overcurrent Device. Section 4321-4333 covers this question which involves many conditions of use. Assuming however that the motor is rated for continuous duty, the overcurrent device shall be rated or set at not more than 125% of the motor full-load current rating for 40°C motors and 115% for all other types of motors. Section 4309 definitely requires however that such running protection shall be based on the actual nameplate rating of the motor. Columns 5 and 6 of Table No. 20 which cover this point must be modified when the nameplate ratings vary from those shown in Tables 21-24. In the case of the 5 hp motor $125\% \times 15 = 19$ amps or 20 amps as shown in Table 20 (non-adjustable devices). Here again an exception is made for intermittent duty motors.

Motor Disconnect. Section 4402 requires the disconnecting means to be a motor switch, rated in horsepower or a circuit breaker. There are several exceptions which are clearly covered in this rule. In the case of the ten and five horsepower motors, when a switch is used, they must be rated 10 and 5 hp respectively. In the case of the 1.5 hp motors, the disconnecting means may be a general use switch having an ampere rating at least twice the full-load current rating of the motor.

Size of the Feeder. Section 4314 covers this point and requires a feeder serving several motors to have a capacity not less than 125% of the full-load current rating of the highest rated motor in the group plus the sum of the full-load current ratings of the remainder of the motors in the group. In the installation under discussion the feeder size would be $27 \times 125\% = 34$ amps. $34 + 15 + 5 + 5 = 59$ amperes. No. 4, Type R conductors.



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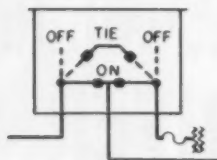
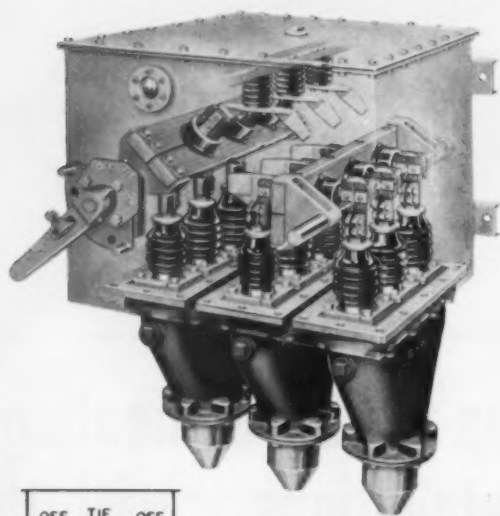
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Size of Feeder Fuse. Section 4362 requires this over-current device to be of a size not greater than the largest rating or setting of the branch circuit protective device for any motor of the group (based on Tables 26 and 27, Chapter 10, plus the sum of the full-load currents of the other motors of the group. In the case in question the 10 hp motor we have $300\% \times 27 = 81$ amperes. $81 + 15 + 5 + 5 = 106$ amperes. There is also an exception here to cover heavy capacity feeders installed to provide for future changes. In this case the overcurrent device may be based on the rated capacity of the feeder.—B.A.McD.

Sealing Fittings

Q. *We are wiring a gasoline tank farm and the local inspector has insisted on the use of sealed fittings adjacent to a pull box which does contain a tap off from a feeder run and inasmuch as this box is explosion-proof and does not contain any sparking or arcing devices, we see no reason for providing a sealing fitting in the conduit run on either side of this box. Are they required by the Code?—M.K.*

A. In each conduit run two inches or larger entering an enclosure or fitting housing terminals, splices or taps, it is necessary to provide sealing fittings even though there are no sparking or arcing devices contained within such enclosure. This will be found under paragraph a. 2. of Section 5015 of your National Electrical Code. Therefore, if the conduit sizes used for your feeder run were two inches or larger, your inspector was correct in insisting on the use of sealing fittings in those conduits within 18 inches of the junction box or pull box in question. If, on the other hand, the box was strictly a pull box and used for no other purpose, then the sealing fittings would not be required.—G.R.

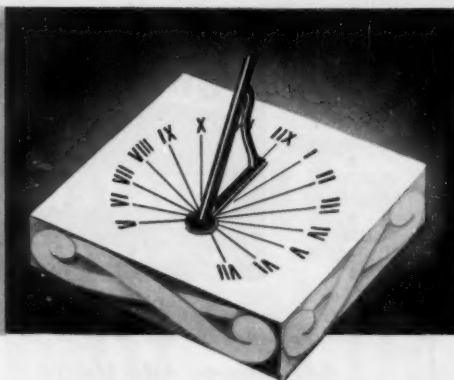
Conduit Fill

Q. *When figuring the number of conductors in a conduit, for example 6 No. 12 TW, is it permissible to calculate 40% of the conduit area rather than using Table 4 which is based on RH insulation? A 40% area calculation requires a ½ inch conduit while Table 4 requires a 1 inch.*

From Table 19, area of ½ in. —.30 sq. in.
From Table 13, area of No. 12 TW —.0172 sq. in.
6 x .0172 —.1032 sq. in.
From Table 12, 40% area of ½ in.—.12 sq. in.
Actual fill therefore .1032/.3 or 34%.
—S.W.B. and W.W.G.

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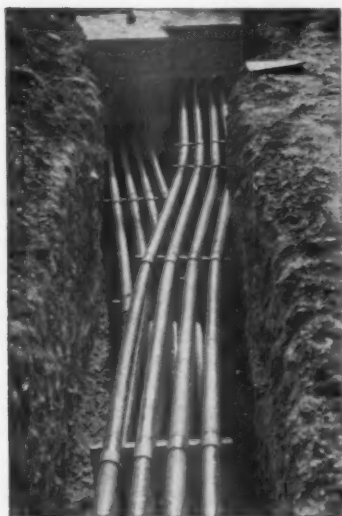
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A. The 1953 Code will clear up your problem. In the past Codes it has not been too clear as to when the actual dimensions of the wire could be used, although the intent was that the Table 4 had to be used for all new work regardless of the type of insulation used.

The 1953 Code in Section 3466 states definitely what tables must be used when figuring for new work and when figuring for rewiring work.

So to answer your question directly, if the job is one involving the rewiring of existing conduits which cannot be readily increased in size without disturbing the present building construction, then you may use 40% of the actual wire size and use a smaller conduit. In fact you may use up to 50% fill in your particular case. However, if this is a new installation, then Table 4 must be used. The purpose of this requirement is to provide for the future possibility of requiring more load on the system. The conduits at that time may be filled to the higher capacity as outlined in Tables 11 and 12 with the smaller diameter wires.—B.Z.S.

Increasing Service Capacity

Q. We want to increase service capacity to an existing building now served by three 250,000 circular mil conductors supplying 115/230 volts to this building. If we parallel the existing raceway, can we place two 250,000 circular mil conductors having the same insulation in the new raceway without the inclusion of a third wire or neutral as the present neutral in the existing raceway has ample capacity for the 115-volt load?—O.S.C.

A. No. Wherever conductors are run in multiple, it is necessary to comply with Section 3105 and 3018 of the National Electrical Code. You will note under Section 3018 that "If the capacity of a circuit is such that it is impracticable to run all conductors in one enclosure, the circuit may be divided and two or more enclosures may be used providing each phase conductor of the circuit and the neutral conductor, if one is used, are installed in each enclosure." Then under Section 3105 you will note in the second sentence the following: "Where conductors are run in multiple, they shall be arranged and terminate at both ends in such a manner as to insure equal division of the total current between all conductors that are involved."

Therefore, in your case it would be

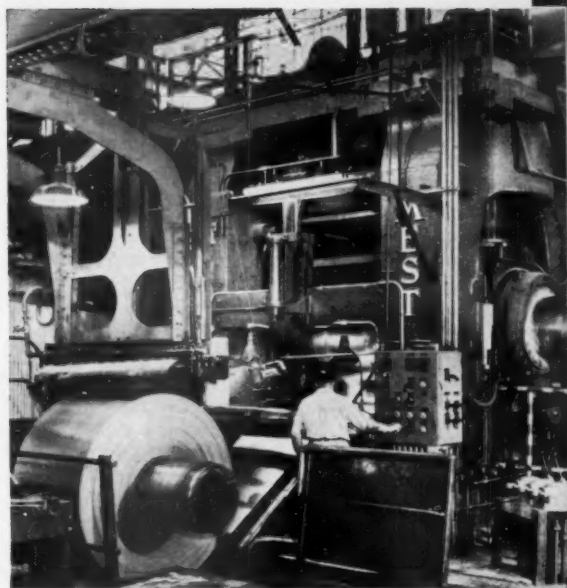
160 PRODUCTION HOURS PER WEEK

MAKE

OKOLITE- OKOPRENE

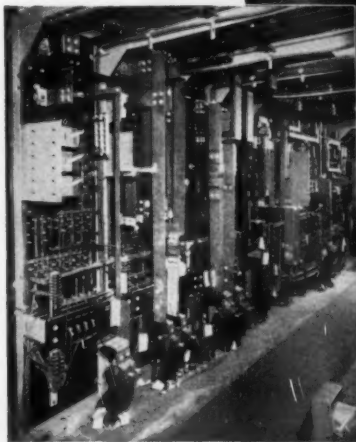
A MUST

FOR THIS MILL



Round-the-clock operation of this temper mill is typical of the severe conditions that have proved Okolite-Okoprene's dependability in industrial service.

This interior view of the motor room shows the control panels for the temper mill, wired for dependability with Okolite-Okoprene.



OKONITE



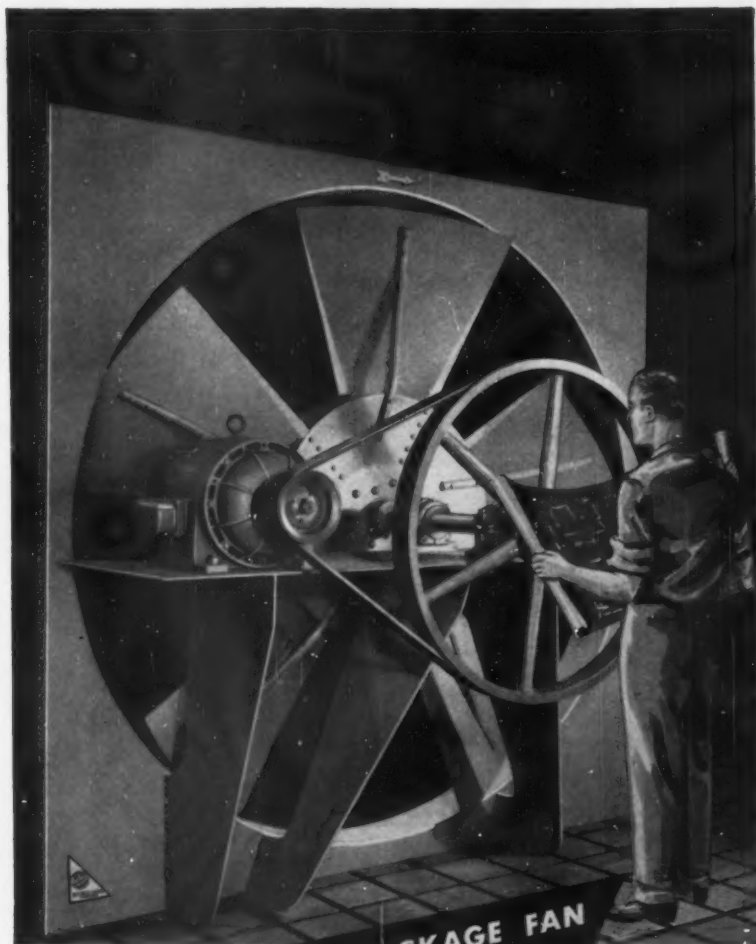
insulated cables

Operating schedules on the 77-inch Temper Mill at Jones & Laughlin's Cleveland plant call for 20 turns a week of eight hours each—160 hours per week—and the schedule is kept. As in so many other steel plant installations where loss of production due to equipment failure is a serious factor, Jones & Laughlin here relies on Okolite-Okoprene to eliminate electrical outages.

Millions of feet of Okolite-Okoprene installed in every service under every operating condition prove the toughness and dependability of Okolite-Okoprene wires and cables. Steel mill applications, where heat, moisture, oil and abrasion destroy ordinary cables, are the best testimonial to the high quality of Okolite-Okoprene. The Okoprene sheath—Okonite's neoprene compound—will not rot or deteriorate under the most difficult operating conditions. Okolite insulation, proved in use for 30 years, provides excellent ozone, moisture and heat resistance, high dielectric strength and long life.

Bulletin EC-1053 contains full information on the applications and advantages of Okolite-Okoprene. Write for it today to The Okonite Company, Passaic, N. J.

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DELIVERS 80,000 cfm AT 1/4" S. P.
REQUIRING ONLY 15 H. P. MOTOR!**

Recently delivered for ventilation of a midwest power plant, this giant "Buffalo" Heavy-Duty Package Propeller Fan is inexpensively wall-mounted. Its husky eight-foot belt-driven wheel exhausts a volume of air which formerly required a more costly fan. Just an example of how the new, expanded line of "Buffalo" Propeller Fans (package units complete with drive now available in capacities up to 250,000 cfm!) can do more and more jobs for you, better than ever before. Write today for catalogs!

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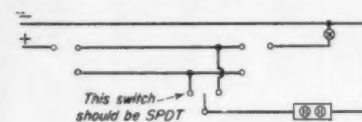


BELT-AIR FANS
"NV" BREEZE FANS

possible to pull the present neutral conductor from the existing pipe and replace it with a smaller conductor provided the neutrals in both pipes were of the same size and had the same insulation and length.—G.R.

Three-Way Switch Comment

Q. In March, 1954 "Electrical Construction and Maintenance," page 175 there appears a circuit sketch. Below is a copy slightly altered to make tracing clearer. Your sketch, if barn light is lit, and receptacle dead when you leave barn, then go to house and turn off barn light, the receptacle will be alive and barn light out. Changing receptacle switch to single pole double throw will accomplish the desired result.—G.C.K.



A. The point covered by your observation is well taken and your solution would eliminate the objection outlined in your letter. In answering the original question, it was my impression that the main objective was to have full control of the lights at all times and that there was no particular concern with respect to the receptacle being live or dead. While the use of a "single pole double throw" switch would assure us that the receptacle would be dead when the switch was in the neutral position, there would be no assurance that it would remain either live or dead when in the closed position. For example: the lights are lit and the receptacle is live when you leave the garage and when you turn off the lights in the house, you would also disconnect the receptacle, and if there was any portable connected which was desired to be used, its use would be governed by the position of the three-way switch in the house. From this angle it would be confusing to the householder to determine when the receptacle was live or dead.

It also follows, in case you desire to use a portable tool or lamp in the daytime without using the large general lamps, a three-way or a double-throw switch would permit such use provided no one in the house operated the 3-way or 4-way located there. It could be annoying when using a portable lamp and tool to have them disconnected by the house switch. As long as the receptacle is fed through the 3-way located in the house, we cannot completely isolate its use.—B.A.McD.

It takes just a handful

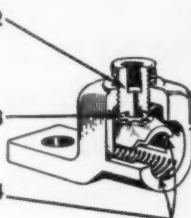
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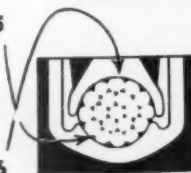
Fitting operates on 2
screw-and-saddle principle.



Built-in lock washer 3
keeps fitting tight.

Serrated saddle and 4
body for better grip.

Force applied here is 5
greatly multiplied by
leverage screw...
gives tight all-around
grip on cable.



T & B designed saddle 6
securely holds
large cables or small
cables of all types.

T & B Lock-Tite fittings are engineered for long
service... they cost you less to install—
be sure to use them on your next job.



LOCK-TITE LUG

One-piece design holds all
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stranded flexible, extra flexible,
hemp core, rod, and tubing.
Uniform all-around pressure
means high conductivity.
Only 7 sizes handle all cables
from #4 solid to 1000 MCM.



LOCK-TITE TEE-PARALLEL TAP

A versatile, one-piece fitting
for use as a tee, parallel, elbow,
crossover, two-way, or reducing
connector. Hinged top
hooks over the "main"... lower
opening holds the "branch".
Only 13 sizes connect all combinations
of "main" cable (1/0
to 1000 MCM) to "branch"
cables (#2 to 1000 MCM).



LOCK-TITE TWO-WAY CONNECTORS

Neat and smoothly-rounded fittings
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several cable sizes—you can
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easy to tape. Only seven
sizes handle all cables from #4
solid to 1000 MCM.

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Compact, one-piece connector
taps small branches to
large mains. Self-adjusting
jaws grip main and branch
cables all around. To make a
tee tap, just bend the branch
wire at right angles. Installed
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of "main" cables
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MCM) to
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wires (#14
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tongue is serrated for
positive grip on cable (sizes
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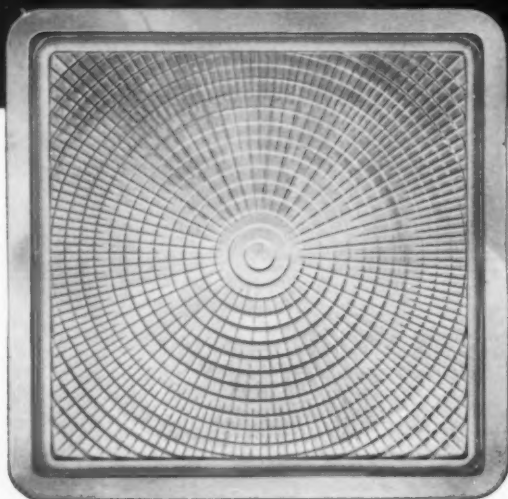
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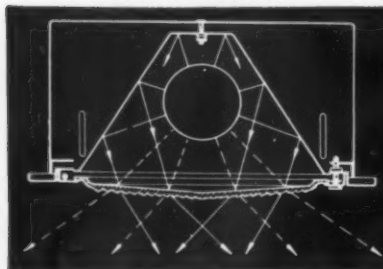
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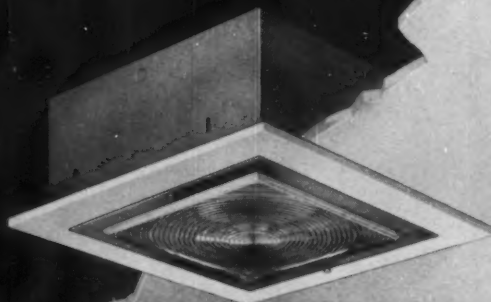
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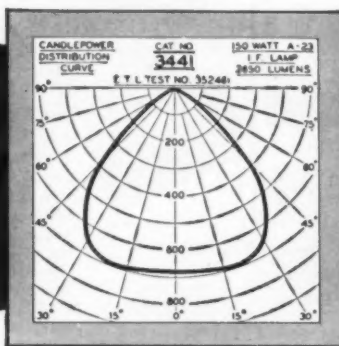


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Manufacturers of Engineered Incandescent Lighting

In The News

Power Use to Double-Double by 1970

Economists project trends, see power use doubling each decade, 40 million more people, \$560 billion in gross national product by 1970.

The story of the American economy is a story of growth. There have been ups and downs—and one disastrous depression in the '30s. But still the economy has kept growing in the long run. The amount of goods we produce and consume has about doubled every 25 years.

Growth Of The Total Economy

Population is growing over two million each year. The *gross national product*—total output of goods and services—has been increasing at an average rate of almost 3% per year since 1930. In an overall way, population and G. N. P. indicate the size of the American economy—how many consumers there are, and how much it takes to supply them.

These two series are interdependent. Increasing population has provided the labor force to support more production. And it has also provided the market for this output. Production, in turn, creates income, which gives the market its buying power.

In 1953, out of our total population, 61 million people were at work. Their average output, measured in 1953 market prices, was \$2.82 per man-hour. And they worked an average of 41 hours per week during the 52 weeks of the year. The result was a *gross national product* of \$367 billion.

From this total output of goods and services, about \$60 billion went to replace resources and capital equipment that wore out during the year. About \$60 billion went for government services (including defense) and was paid for out of taxes. The rest of the national product became the real income of individuals and business firms.

This \$247 billion of national product consisted of materials and equipment for business use and goods and services for consumers. As it was produced and sold, there was created \$247 billion of money income in the form of wages, salaries and profits with which the goods could be bought. Of course, in our interdependent economy, few

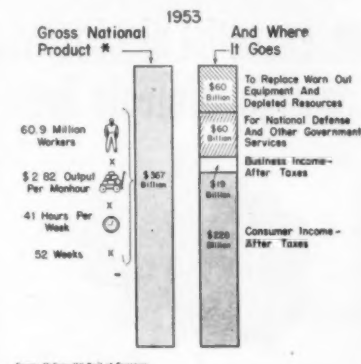
people bought the same things that they produced. But in total, the dollar income created by production was equal to the value of output. And this created the market to buy the goods.

How much will our national product increase in the future? As in the past, this will depend on the size of the market to be served, on the labor force available, and—perhaps most important—on the resources and skills that the labor force can put to work. In other words, it will depend largely on the output per man, or per man-hour,

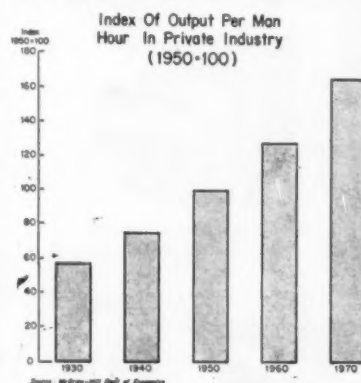
that our labor force can achieve. The economists' term is "productivity," which—strictly defined—means the amount of national product resulting from one man-hour of labor.

Chart 2 shows the expected growth in *population and labor force*, as the experts have projected them to 1970. Obviously, the total market is going to grow considerably, with total population reaching over 200 million. The labor force will grow, too, but not quite as fast, from 65 million to 82 million. These projections were made by the Bureau of Labor Statistics.

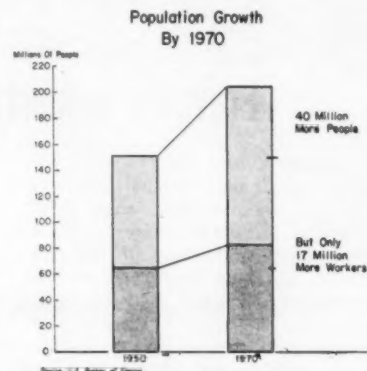
The key factor in projecting economic growth is *productivity*. From 1930 to 1950, productivity (output per man-hour) increased about 2% per year, as shown by Chart 3. Since 1950,



GROSS NATIONAL PRODUCT, 1953 and where it goes. (Chart 1)



OUTPUT PER MAN-HOUR is moving up. (Chart 3)



EXPECTED GROWTH in population and labor force. (Chart 2)



HOW PRODUCTIVITY and where it goes may look in 1970. (Chart 4)

When storms knock out electric power...



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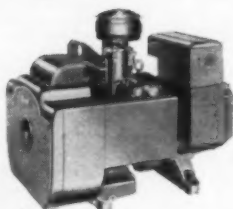
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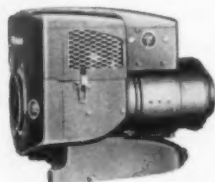
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50,000 watts

the gains have been somewhat larger. With further improvements in technology during the late '50s and '60s, we may hope that average output per man-hour will increase as much as 2.5% per year. This will call for the best equipment, the best in management ingenuity and the best in labor cooperation. But it is a rate that is definitely attainable. Good years in the past have seen gains of over 3%.

If labor force increases as expected (this is a pretty sure thing, since all these people are already born) and if output per man-hour increases 2.5% per year, gross national product will grow from \$367 billion in 1953 to \$415 billion in 1960 and \$560 billion by 1970. (All in 1953 prices). These estimates allow for a drop in the average workweek from 41 hours in 1953 to 38 hours in 1960 and only 35 hours by 1970. It seems reasonable to expect that one result of higher productivity will be this increase in leisure.

Changing Technology

Forecasting the future is more than a matter of saying how many dollars worth of goods will be produced. There's also the question of technology—what sort of materials and production techniques will be developed to meet our expanding needs. In the years ahead, changes in technology may create as many new demands as the increase in sheer quantity of goods consumed.

More Capital Goods

All these changes in technology will create higher demand for capital goods. Capital spending will be greater than in an economy that was simply producing the same goods by the same methods—even in increasing quantity. In addition to increasing capacity, the rapid pace of technical improvements will call for continuing modernization of plants and equipment.

To keep pace with the growth we have indicated, for population and gross national product, will require a 65% increase in manufacturing capacity by 1970. Electric power companies must triple their generating capacity.

Public Works

In addition to a large private demand for capital goods, we may expect increased spending on public works. There are many new demands for public services. And public construction is necessary to meet them. *It seems reasonable to predict that public construction will increase every year for the next decade.*

Our Basic Industries

It takes materials, as well as equipment, to turn out the goods. So our needs for basic materials will grow.



INSTALLATION: North Coventry Township School,
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DESIGNED BY: Eastern Engineering Co., Reading,
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169

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In fact, the demands of the economy are very likely to grow faster than we can increase output of the older materials—such as wood, copper or high-grade iron ore. And we'll turn more and more to the newer materials—such as aluminum, plastics, ceramics and fibrous glass.

Fuel and Power

By 1970 we shall be using twice as much power per worker in industry and up to five times as much electricity in the average home. The total result: *three times as much electric power consumed each year.*

Where will we get the fuel? Mostly, from the same sources we use now—coal and oil. But by 1970, as much as 20% of the *new* power installations (3% of capacity in place) may be utilizing *atomic fuel*. Up to 1970, the main effect of the rise in power generation on fuel demand will be to *increase coal requirements* of the power industry. These may go up 150% by 1970, even with improved burning techniques.

Imported fuel oil will still be useful for power generation and home heating. But most of our domestic oil supplies will probably be converted—by improved refining techniques—into chemicals, gasoline and lubricants. These are the high value products that will justify the increasing cost of discovery and production from our domestic reserves. If necessary—though also at high cost—the oil industry can convert shale or coal into petroleum-type fuels. *Our total demand for petroleum products will rise over 100% by 1970*, mainly because of the increase in travel by car, plane or train—all driven by fuel-hungry turbine engines.

New Markets For Consumer Goods

The average consumer of the 1960s will have a lot more money to spend than in the 1950s. *It is estimated that by 1970 per capita income may rise over 40% from the 1950 level.* That would be real income, measured in constant prices. And most of the gains will occur as people from the lower income brackets work up to middle incomes—and later fairly high incomes—where they can greatly increase their spending.

Housing

The greatest improvement in the American standard of living between now and 1970 is likely to be in housing standards. Mass-production methods—whether factory prefabrication or large-scale fabrication at the site—will bring costs down. And higher incomes will lead to a demand for higher quality. So the homes that are built in the future will be bigger, better designed

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For the full story on the "Featherweight Champ" see your local Oster Distributor. He will give you sound recommendations on how to solve your pipe-threading problems . . . and he offers you speedy delivery and reliable service.

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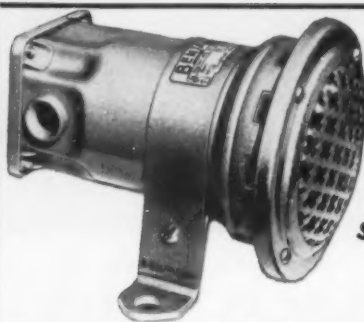


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Time Table for 1956 National Electrical Code

The National Electrical Code Committee announced in Bulletin No. 54-4 the following suggested Time Table for the next revision of the National Electrical Code—1956 Edition:

Jan. 1, 1955—Final date for receipt of proposals for revisions.

Jan.-May, 1955—Code Making Panels considering proposals for Code changes and preparing reports.

May 1, 1955—Panel reports made to Correlating Committee.

August, 1955—Panel reports published for distribution to Electrical Section members and others interested.

Aug.-Dec., 1955—Period for study by electrical industry and recommendations to Panels for changes.

Jan. 30, 1956—Panels make final report to Correlating Committee.

Feb. 16, 1956—Correlating Committee submits proposed changes to NFPA for printing and distribution.

May, 1956—Review by Electrical Section and NFPA Annual Meeting. Submittal to NFPA Board for approval. Submittal to American Standards Association for status as American Standard.

September, 1956—Publication of New Code.

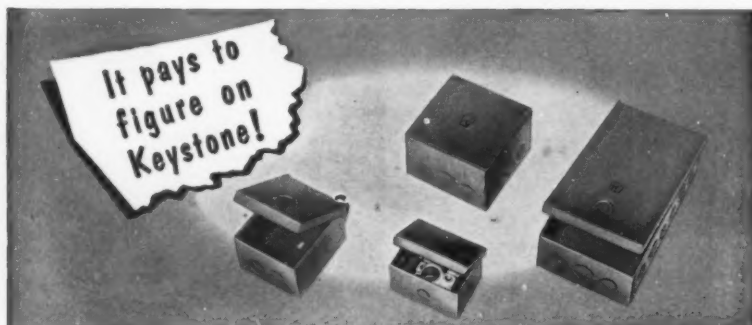
Coordinating Committee Urges A-W Support

Meeting with the electrical press on June 29, the members of the Conference Group on Coordination of Electrical Industry Sales and Promotional Programs reviewed its activities and accomplishments during the first year of its existence and its plans for the future.

Associations represented on the Conference Group include:

- Edison Electric Institute
- International Association of Electrical Leagues
- National Appliance and Radio-TV Dealers Association
- National Association of Electrical Distributors
- National Electrical Contractors Association
- National Electrical Manufacturers Association.

J. Reed Hartman, vice president of the Cincinnati Gas and Electric Company and Chairman of the Conference Group, acting as spokesman for the inter-industry group, listed the fol-



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KEYSTONE MANUFACTURING COMPANY

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Sold Through Leading Electrical Distributors Coast-to-Coast

lowing as the major benefits which have accrued to the associations as a result of the Conference Group's meetings and activity:

(1) Better understanding of the objectives of the promotional and sales activities of each association represented resulting from across-the-table exchanges of ideas.

(2) Appreciation by all segments of the industry of the problems peculiar to each segment in the formulation and activation of its sales and promotional programs.

(3) Wider dissemination of information within the electrical industry on sales and promotional activities resulting in greater opportunity for the coordination of these activities.

The Conference Group plans to broaden its base by inviting other national electrical associations to join with it in its discussions.

Electrical contractor members of the Committee are E. J. White, Edward J. White Co., Inc., Newark, N. J. and R. K. Robinson, Robinson Electric Co., Inc., Charlotte, N. C.

IES Elects New Officers

The Illuminating Engineering Society announces its new slate of officers for the next fiscal year, beginning October 1, 1954 and running until September 30, 1955, as follows:

President—Duncan M. Jones, Curtis Lighting of Canada, Ltd., Montreal; *Vice-President*—Marshall N. Waterman, Westinghouse Lamp Division, Bloomfield, N. J.; *General Secretary*—Kirk M. Reid, General Electric Company, Cleveland; *Treasurer*—George J. Taylor, Day Brite Lighting, Inc., New York City; *Vice-President* (2nd year of 2-year term)—R. F. Hartenstein, Ohio Edison Company, Akron, Ohio; *Directors* (2 for a 3-year term)—L. C. Twichell, Rochester Gas and Electric Corp., Rochester, N. Y. and John S. Walsh, Pacific Gas and Electric Company, San Francisco, Calif.

Regional Vice Presidents were elected in five of the Society's ten Regions, as follows: *Northeastern Region*—C. W. McCormick, Connecticut Light & Power Company, Hartford, Conn.; *Great Lakes Region*—A. C. Sangster, The Detroit Edison Co., Detroit, Mich.; *Midwestern Region*—James R. Chambers, Benjamin Electric Mfg. Company, Des Plaines, Ill.; *Pacific Northwest Region*—Blair E. Plowman, The Washington Water Power Company, Spokane, Wash.; and *South Pacific Coast Region*—Prof. Dan M. Finch, University of California, Berkeley, Calif.

Cuts Metal 15 Times Faster than Hand Hack Saw!



Only
NEW . . . Porter-Cable
Portable Band Saw **\$215.00**

Slices through 1½" cold rolled steel in 41 seconds! That's fifteen times faster than a good man with a hack saw . . . *two-and-a-half times faster* than bulky power hack saws!

You can use this 16-pound work-demon anywhere—on ferrous or non-ferrous metals or "problem" materials. Take it into equipment yards, stock bins . . . tight spots where costly hand sawing is the only other answer. Use it for general maintenance, teardowns. Compact, easy to handle, Porta-Band delivers smooth controlled sawing in any position. Only the cutting part of the blade is exposed. Cutting

action pulls the blade snugly into cut, holding saw firmly in place.

Powered for heavy duty . . . perfectly balanced . . . Porta-Band handles the toughest assignments. Band speed of 240 feet per minute insures swift, smooth cutting of all materials up to 3¼" diameter round, or 3¼" x 4¼" rectangular. Highest grade precision ball and needle bearing throughout. Aluminum alloy frame for lightness, toughness. Universal 115V AC-DC, 25-60 cycle motor (230V available at extra cost).

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Quality Electric Tools

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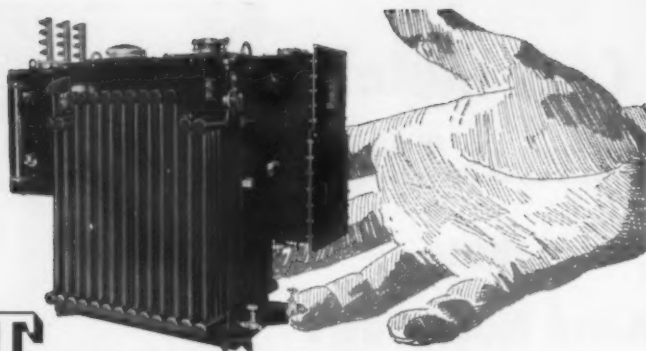
Company

Type of Business

Street

City County State

Manufacturers of Speedmatic and Guild Electric Tools

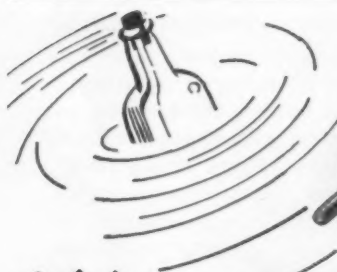


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Thirty years ago STANDARD began manufacturing quality transformers, tailored to the particular needs of the customer. Many of these same transformers are in operation today. Long-lived and dependable . . . these transformers are maintaining peak efficiency after 30 years of constant operation. Designs have been changed and bettered since then, but the quality, dependability and long life are still there. Call STANDARD today!



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Moisture cannot penetrate the one-piece Neoprene body of a JOY electrical plug . . . when engaged, even its contacts are enclosed in a protective Neoprene housing through the cork-like action of JOY'S famous water-seal. Permanently vulcanized to cable, it cannot crack . . . won't lose its shape . . . and requires no special considerations to insure a long life of useful service. A favorite since '26, JOY electrical connectors are now available in styles and sizes for nearly any portable electrical power transmission need. Why risk electrical misfits when the best actually costs less, in the long run? Write for full details including literature today!

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M.E. 152.1

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . AUGUST, 1954

N. Y. State Contractors Convene at Saranac

"Adequate Wiring for Modern Electrical Requirements" was the theme of the 55th annual convention of the New York State Association of Electrical Contractors and Dealers, Inc., held at Saranac Inn, N. Y., June 29-July 2. Over 400 members and guests registered for the meeting.

The first session was "Contractors Day" and A. Lincoln Bush, chairman emeritus of the Association, presided. James D. Lynett, state superintendent, Bureau of Electricity, Board of Fire Underwriters, New York, spoke on safe electrical wiring for the protection of life and property. Dollar-wise, defective electrical wiring is to a great extent due to the work of handy men, unlicensed men and "Do-It-Yourself" people.

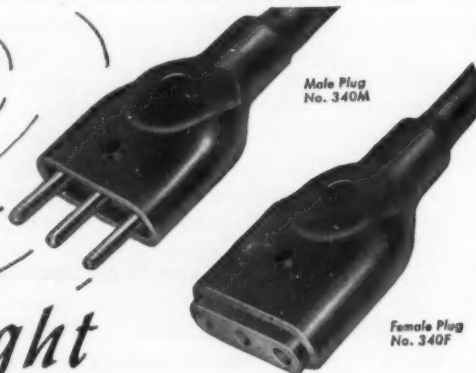
The idea of creative selling as an organized industry-wide program is relatively new in the electrical contracting industry, according to S. J. Cristiano, director, Eastern Region, NECA. He said that the greatest opportunities for such creative selling are going to be found in the fields of adequate wiring, preventive maintenance and industrial modernization.

Thomas G. Gorman, sales director, State Insurance Fund, New York, reported that the Governor recently signed a bill increasing the workmen's compensation pay to injured employees and widows. Yet the general rates of the Compensation Rating Board have been reduced.

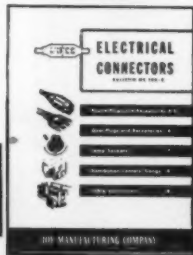
Herman L. Weisman, general counsel of the New York Electrical Contractors Association, Inc., gave an inspiring talk on "The Obligation of an Electrical Contractor to the Public from the Viewpoint of Mr. Average Citizen."

Wednesday was "Utilities Day" and C. Wesley Meytrott, assistant vice president, Consolidated Edison Company of New York, acted as chairman. J. E. Doolittle, assistant vice president, Central Hudson Gas & Electric Corp., Poughkeepsie, spoke on the future growth of the electrical industry and where it is going to go. Ralph Wagner, new business manager, Niagara Mohawk Power Corp., Albany, reviewed what has been done in the field of educating the general public, all segments of the industry and the regulatory authorities on the adequate wiring situation.

J. O. Covington, manager, Adequate Wiring Bureau, Consolidated Edison Co. of New York, outlined his company's adequate wiring program, which was organized to offer constructive advice and selling help to architects, engineers, builders, contractors, lending institutions, customers and anyone



FREE





W. L. DREXLER, newly elected president of the New York State Electrical Contractors and Dealers, Inc.

else who should have up-to-date information on electric energy usage and its relation to adequate wiring. J. E. B. Stuart, superintendent, Coordinating Bureau, Consolidated Edison Co. of New York, discussed 265-460-volt systems for skyscrapers. "The Magic Link", a new sound motion picture produced by the Consolidated Edison Co. was shown.

Thursday was "Manufacturers and Wholesalers Day" and the chairman was R. S. Kersh, vice president, Westinghouse Electric Corp. Warren H. Young, regional manager, the Bryant Electric Company, Newark, N. J., outlined the material available to promote adequate wiring. R. L. Whitney, district manager, Apparatus & Supplies, Westinghouse Electric Supply Company, Rochester, discussed the role of the distributor in the adequate wiring program.

Howard H. Weber, manager, Wire Sales, United States Rubber Co., New York, said that 700 billion feet of wire will have to be installed throughout the nation in order to utilize the added kilowatts projected by 1957.

Andrew Doremus, manager, Advertising & Sales Promotion, General Electric Co., Bridgeport, Conn., stated that 1954 is expected to produce more than 1,000,000 new homes and not one-third of these new buildings will be adequately wired, equipped to accept the labor-saving appliances that are ready for use by home owners.

At the business session on Friday, W. L. Drexler, New York City, was elected president; H. F. Janick, Rochester, first vice president and secretary; H. A. Webster, New York City, second vice president; and R. J. Knoblock, Syracuse, treasurer. E. G. May, Albany, chairman, and A. A. A. Tuna, New York City, vice chairman, were reelected.

BIDDLE *Instrument News*

ARE YOU SURE OF PROTECTION THROUGH YOUR GROUND CONNECTIONS?

Megger® Ground Tester measures low resistance



Photo Courtesy Copperweld Co.

In spite of apparently good lightning rod or arrester protection, lightning frequently will cause severe damage if high ground resistance hampers its dissipation in the earth. Lightning storms are prevalent in the north-eastern states during the spring and fall months. Plants in this section should make

a thorough round of ground resistance tests. Aside from the hazards to personnel, thousands of dollars may be saved in damage to electrical equipment and in loss of power and stoppage of production.

The MEGGER Ground Tester is the easiest, quickest and most accurate method of determining ground resistance. It is an instrument specially designed for the purpose and should be used wherever possible. Direct readings are automatically obtained in ohms. It provides its own source of current—no batteries, or other remote source required. It's easy to carry, too. Has approval of the Associated Factory Mutual Insurance Companies.

Don't put it off—write today for "Grounding Electrical Circuits Effectively" by J. R. Eaton (**Bulletin 25TECM**) and our Biddle manual on "Ground Resistance Testing" (**Bulletin 25JECM**).

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Insulation Tester
*Operates
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From Case*



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for Your
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Instruments
\$11.00 EACH**

Practical electrical men appreciate the convenience of this new leather case designed for the protection and easy operation of the Midget Megger Insulation Tester. Like a fine camera case, just flip back the lid and operate. Instrument is securely locked in. Leads store in a compartment under the instrument.

If you don't have a Midget Megger Insulation Tester, it will pay you to investigate the convenience of this handy test set. It contains its own source of test current in a hand generator. No dependence on batteries or other power supply. Ratings up to 50 megohms, 500 volts d-c are available. Write for **Bulletin 21-85-ECM**

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☐ Bulletin 25JECM ☐ Bulletin 21-85ECM
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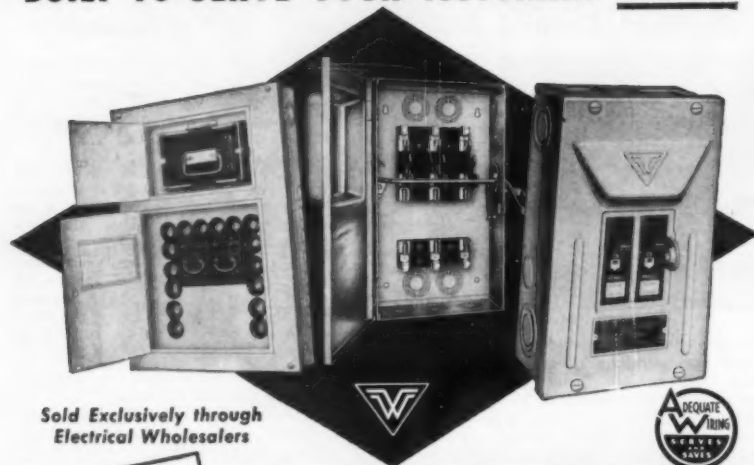
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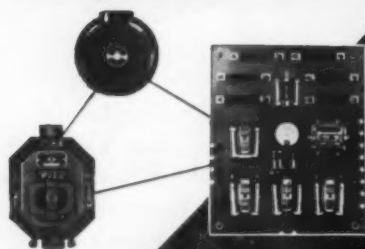
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Both coded and non-code types are available in various arrangements depending on type of building or establishment. Although Interior Fire Alarm Systems are intended primarily for warning occupants of a building, they can be connected into a municipal system.

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NISA News

Ontario Chapter met June 13 at the Prince Edward Hotel in Windsor for a brief business meeting the day before the National Convention in neighboring Detroit, then on to the Motor City to register for the convention.

Chicago Chapter held its regular monthly meeting June 8 at the Tower Club. Two color motion pictures, both featuring vacation possibilities in Wisconsin, were shown. A demonstration of "Protection" was also included.

Milton H. Eisenhardt, who operates a business under his own name in Merchantville, N. J., is the new president of Quaker City Chapter. Other officers are: vice-president, William M. Hendrickson, W. M. Hendrickson & Co., Philadelphia; treasurer, C. R. Durand, H. N. Crowder Jr. Co., Allentown, Pa.; executive committee, Robert S. Swanson, Electric Motor Service, Kennett Square, Pa.; Harold Hane, Standard Electric Service, Reading, Pa.; and William E. Storck, Watts & Stern, Inc., Philadelphia. They met June 25, at Lu Lu Temple Country Club, North Hills, Pa. for annual dinner and golf tournament.

Samuel Heller of Consolidated Electric Motor Co., New York, gave a comprehensive talk on ac and dc rectifiers at the May 20 meeting of NISA's New York Metropolitan Chapter, discussing the how, when and why of selenium rectifiers and how they can be applied successfully to battery chargers, elevators, electroplaters and exciters. He also demonstrated a small, variable voltage drive.

New officers of the Youngstown Chapter are; president, Robert F. Cutler, The Economy Electric Co.; secretary-treasurer, Frank Ortega Jr., Frank's Electric Co.; and news reporter, John B. Winkle, J. B. Winkle Co. All located in Youngstown.

New officers for North Central Chapter, Minneapolis, include: president, Warren Mielke, Mielke Electric Works, Inc., Duluth, Minn.; vice-president, Gordon W. Kunde, Benson Motor Electric, Brainerd, Minn.; secretary-treasurer, James J. Anderson, A&P Electric Repair, St. Paul, Minn.

Oregon Chapter elected new officers recently. President is John C. Reed, Reed Electric Co., Portland; vice-president, Ray Losli, Skeen Electric Works, Portland; and secretary, Jack Morgan, C. E. Riggs, Inc., Portland. From Walter J. Prise, The Maintenance Co., New York, N. Y.

DATES AHEAD

International Association of Electrical Inspectors—Eastern Section, Atlantic City, N. J., August 30-31; Southwestern Section, Elko, Nevada, September 13-15; Northwestern Section, Portland, Ore., September 23-25; Canadian Section, King Edward Hotel, Toronto, Ont., Canada, October 4-6; Western Section, Louisville, Ky., October 11-13; Southern Section, Tampa Terrace Hotel, Tampa, Fla., October 25-27.

Illuminating Engineering Society—National Technical Conference, Chalfonte-Haddon Hall, Atlantic City, N. J., September 12-16.

Canadian Electrical Manufacturers Assn.—Annual meeting, Sheraton-Brock Hotel, Niagara Falls, Ont., Canada, September 22-24.

International Association of Electrical Leagues—Bellevue Stratford Hotel, Philadelphia, Pa., September 29-October 2.

Eastern Canada All Electrical Show—Show-Mart Exhibition Hall, Montreal, Quebec, Canada, October 6-10.

American Institute of Electrical Engineers—Fall general meeting, Morrison Hotel, Chicago, Ill., October 11-15.

New Jersey Council of Electrical Leagues—18th annual convention, Hotel Ambassador, Atlantic City, N. J., October 15-16.

National Safety Congress and Exposition—Conrad Hilton Hotel, Chicago, Ill., October 18-22.

National Electrical Contractors Association—Annual convention, Jung Hotel, New Orleans, La., October 27-30.

National Electrical Manufacturers Assn.—Haddon Hall Hotel, Atlantic City, N. J., November 8-11.

American Institute of Electrical Engineers—Winter general meeting, Hotel Statler, New York, N. Y., January 31-February 4.

National Rural Electric Cooperative Assn.—Annual meeting, Atlantic City, N. J., February 14-17.

National Electrical Manufacturers Assn.—Edgewater Beach Hotel, Chicago, Ill., March 13-18.



TWO VICE PRESIDENTS with a single goal: A good administration and more business for the electrical contractor. Oliver F. Burnett, Jr. (Chicago), who will retire as vice president of NECA District Four this fall, offers a few pointers to his successor Joseph W. Albright (right), Triangle Electric Co., Detroit.

The Features You Asked for:

the **NEW**

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Thousands of Electrical Men
Told Us What They Wanted
— We Included Every Major
Feature — No Other Tester
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for Easier, Safer Use:

**NO OTHER TESTER
HAS ALL THESE:**

 Handier center mount for prod makes testing easier	 Prod storage completely shields sharp tips	 Coil layer-wound on rugged nylon spool for long, safe life
 Molded rubber, moisture-tight prod handles— "No- Slip" safety rings; 30" neoprene leads	 Double strength, seamless plastic case	 Plastic name plate bonded to case— no surface metal
 "Fog-Free" window keeps out dirt	PLUS Famous IDEAL "DOUBLE PROTECTION" ... a solenoid, calibrated indicator AND a neon test lamp, each independent of the other— NO CHANCE OF FAILURE TO DETECT VOLTAGE. TESTS 110 to 550 Volts AC — 110 to 600 Volts DC	

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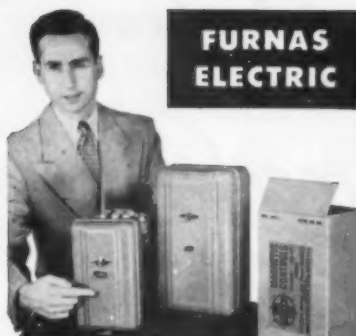
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THE ANSWER TO THIS QUESTION COULD SAVE hard-earned dollars needlessly thrown away.

When choosing from the widest range of starters in the 1-50 hp range, you save by selecting the starter matched to the job—with no wasted capacity.

Furnas Electric starters—nine of them in the 1-50 hp range—are designed and built to match most applications.

Save 25% TODAY LIKE THIS

Here's an example of typical savings you can earn through proper starter selection: for 10 hp service, for example, you'd select Furnas Electric Type YE rated for the job. This saves you up to 25% on initial costs and 40% on space over a YF size 2 (rated 25 hp) normally selected for 10 hp service.

All of the nine Furnas Electric sizes offer worthwhile savings.

Important FEATURES

Furnas Electric starters give you these additional benefits. *Dual Voltage Coils*—matched to motor voltage. *Thermal Overload Protection*. *Shallow Case* for easy wiring. *Durability* to stand up under rough service. *Arc Resistant Terminal Board*. *Arc Quenching Silver Contacts*.

Complete RANGE OF OTHER PRODUCTS

Pressure switches for air and water applications. Drum controllers for reversing, multi-speed and reversing multi-speed service.

Write today for full story or contact our representative near you. Furnas Electric Co., 1067 McKee St., Batavia, Illinois.



Among the Manufacturers

Headquarters Announcements

Black & Decker Mfg. Co., Towson, Md.—three vice presidents: R. G. Horner, sales planning; Adam Quick, production; J. F. Spaulding, general sales manager.

Roller-Smith Corp., Bethlehem, Pa.—W. D. Pierson, Jr., manager, product planning.

Lincoln Electric Co., Cleveland, Ohio—J. F. Lincoln, chairman of the board; William Irrgang, president and general manager; John S. Roscoe, executive vice president.

General Electric Co., Carboly Dept., Detroit, Mich.—Peter J. Jensen, manager of manufacturing.

Cornell-Dubilier Electric Corp., South Plainfield, N. J.—Leslie A. Johnson, vice president.

Marvin Mfg. Co., Los Angeles, Calif.—Robert Fremont, sales manager.

Mitchell Mfg. Co., Chicago, Ill.—R. H. Lodge, sales manager of the new commercial and residential packaged air conditioning division.

Essex Wire Corp., R-B-M Div., Logansport, Ind.—V. A. Hedlund, assistant sales manager.

Graybar Electric Co., New York, N. Y.—D. Wallace, director.

United States Rubber Co., New York, N. Y.—Chester J. Noonan, executive general manager, mechanical goods div.

Line Material Co., Milwaukee, Wis.—George W. Cooper, manager, protective and switchgear equipment sales.

Advance Electric and Relay Co., Burbank, Calif.—J. R. Foster, sales and service manager.

Koppers Co., Inc., Wood Preserving Div., Pittsburgh, Pa.—T. J. McGinnis, assistant to the vice president; Douglas Grymes, Jr. and Paul Wayman, assistant vice presidents.

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.—Frank W. Ladky, assistant to the president.

Electro Engineering Products Co., Inc., Chicago, Ill.—S. E. Byther and W. L. Hotz, national sales representatives.

Westinghouse Electric Corp., Air Conditioning Div., Staunton, Va.—Milton S. Angier, product manager for heat pumps.

Williams Manufacturing Co., Chicago, Ill.—Ford SeBastian, vice president and general manager of the new Sealelectric Division.

Ferro Manufacturing Co., Batavia,

Millions of Steel JIFFY CLIPS

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Export design, choice materials and controlled manufacture have built "top-service and longest life" into Minerallac Electrical Specialties. That's why the electrical industry "prefers Minerallac"... in steel and Everdur for hanging pipe, conduit, BX cable, etc.

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Ill.—E. G. Weissenberger, sales manager.

Pittsburgh Standard Conduit Co., Etna, Pa.—Forwood C. Wiser, assistant to the president.

Mycalex Corp., New York, N. Y.—J. P. Gavron, assistant to the president.

Euclid Electric & Mfg. Co., Cleveland, Ohio—R. G. Schrock, president; Charles S. Ettenger, chairman of the board.

General Electric Co., Lynn, Mass.—C. Howard Black, general manager of the new instrument dept.; D. E. Craig, general manager of the new meter dept.

General Cable Corp., New York, N. Y.—A. Z. Barnes, assistant to the president.

Panellit, Inc., Chicago, Ill.—Walter P. Hooper, administrative vice president.

Cook Electric Co., Chicago, Ill.—B. M. Vinicky, manager of the new Plymold Div.

Automatic Control Co., St. Paul, Minn.—L. H. Mogck, president.

General Electric Co., Schenectady, N. Y.—W. B. Wilson, manager of industrial power generation unit.

Howard Foundry Co., Chicago, Ill. James W. Hudson, manager and A. J. Carroll, assistant manager of a new subsidiary, Howard Electric Co., which will manufacture underfloor duct.

Regional Appointments

MIDDLE ATLANTIC

Metalcraft Products Co., Inc.: W. M. Wyman, Jr., representative for Delaware, south Jersey and eastern Pa.

Du Mont Laboratories, Inc., Mobile Communications Dept.: Herman G. Mamitch, sales representative for northern New Jersey and three southern New York counties.

Thomas Industries Inc., Moe Light Div.: S. B. Levaur, eastern regional manager, offices in New York.

SOUTH ATLANTIC

Federal Electric Products Co.: D. P. Lacock, regional sales manager with headquarters at Atlanta, Ga.

Thomas Industries Inc., Moe Light Div.: Vernon L. Wrye, regional manager.

EAST CENTRAL

Barber-Colman Co., Automatic Control & Uni-Flo Div.: Stanley Simpson, manager of the new Birmingham, Ala. office.

Pittsburgh Standard Conduit Co.: Ralph Hinchman, sales representative, southern Illinois and eastern Missouri.

Line Material Co.: R. E. Saccany, lighting engineer, working out of Cleveland, Ohio.

Graybar Electric Co.: T. E. Mahan,



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**keeps lamps cooler,
cleaner longer**

Get the most from lighting installations with ABOLITE Slotted Neck Reflectors. Slotted neck design — an original ABOLITE idea — starts automatic air circulation around the lamp and through the slots to keep dust and grime from settling. Lamp and reflector surfaces stay cleaner twice as long . . . less maintenance is required. In addition, this design provides 7% more up-light.

LONGER LAMP LIFE

Constant air circulation in ABOLITE units keeps lamp necks cooler, provides maximum lamp life. Lamp neck temperatures are reduced an average of 40°F when tested on 1000 watt reflectors.

WHITER-THAN-WHITE — FLOODS MORE LIGHT

Famous ABOLITE Titanium white porcelain enamel finish reflects all the light from the lamp — provides *highest* lighting efficiency. There's an ABOLITE Reflector for every lighting requirement . . . ask your jobber for complete details.

**WHITER
THAN
WHITE**

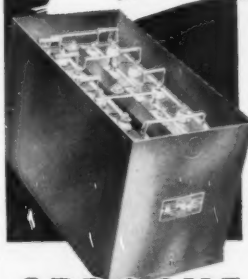
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*...also on wiring, switchgear
and transformer costs!*



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Cut costs by installing Sprague power factor correction capacitors on your motors and other inductive electrical equipment! Monthly power bills can frequently be materially reduced. Greater loads can be handled from existing circuits. Wiring, transformer and switchgear costs can be greatly minimized in new installations.

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We've put the whole power factor correction story in an easily understood 28-page guide 50B, replete with cost saving suggestions and factual installation data. Write for your copy today.

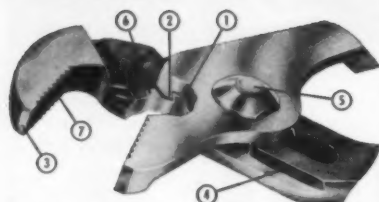
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Look for the Channellock line when you're shopping for hand tools. Channellock pliers offer features that you can't get with other makes. And when you buy a Channellock plier, ask to see the full line—you'll find a style and model to do any job better.



KILGUS AND WATTS, superintendent and foreman for City Electric Co., Dallas, Texas, are the two men guiding electrical work in the large scale expansion and renovation of Titcher-Goettinger Co., a large Dallas department store.

manager, Louisville, Ky.; M. P. Johns, Columbus, Ohio manager; W. A. Arthur, manager at Flint, Mich.

Allen-Bradley Co.: John W. Mason, district manager of the Detroit office.

Roller-Smith Corp.: Lloyd H. Jones, regional manager for Pennsylvania, Ohio and all northern states, west to Washington.

Du Mont Laboratories, Inc., Mobile Communications Dept.: Ramsey McDonald, sales engineer for Kentucky, Indiana and western Ohio.

Thomas Industries Inc., Moe Light Div.: R. W. Vershure, regional manager.

WEST CENTRAL

General Electric Co.: R. G. Clark, district sales manager for communication products in south central Texas, offices in San Antonio.

Graybar Electric Co.: F. M. Sholders, sales manager for Kansas City district; C. C. McGraw, manager at Omaha, Neb.; H. J. Frantz, Austin, Texas manager.

Williams Mfg. Co., Sealelectric Div.: Fred A. Pease, southwestern sales representative.

Warner Electric Brake & Clutch Co.: R. F. Edgar, head of new regional offices in Chicago, handling sales and service.

WEST

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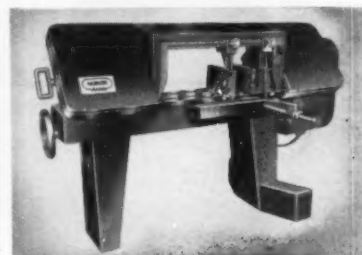
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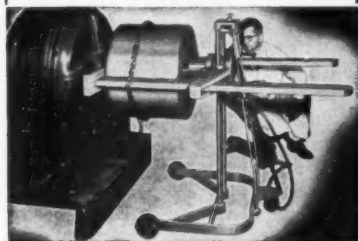
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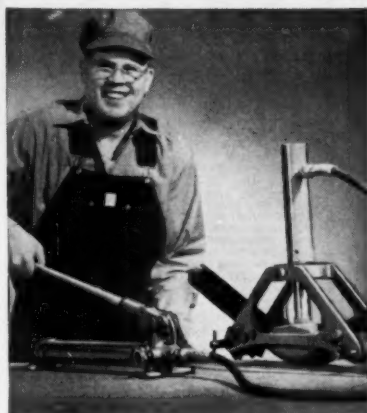
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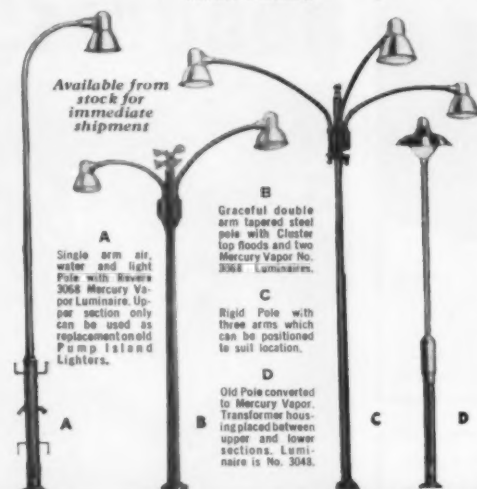
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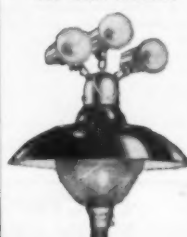
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HOW TO INSTALL AND WIRE BUILT-IN RANGE COMPONENTS

[FROM PAGE 76]

to circuit having two or more outlets to be rated at 50 amperes when 50-ampere branch circuits are used. In the case shown by Fig. No. 2 all of the receptacles must be rated at 50 amperes.

Question No. 8—What is the maximum load permitted on a 50 ampere branch circuit?

Answer—Section 2124-b permits a 50-ampere circuit as shown in the example to be loaded to the full capacity of the circuit.

Question No. 9—What rule recognizes demand factors in computing range loads?

Answer—Sections 2125 c, 2203-d and Table 29.

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Fig. No. 3 covers the wiring installation of the components as I believe it should be made. Here we have a load center, located at the center of distribution of the major portion of the load to be served in the average dwelling. In this case, we not only isolate the components from one another but also isolate each component's wiring circuit. Located in or adjacent to the kitchen, we have a readily accessible means of disconnect for each individual component and when trouble arises with one we may readily continue to use the other components safely. In this case we have more adequate overcurrent protection since each component will be protected by devices whose ratings or settings are more in line with the full load rating of the component. Here we apply the principle of distribution involving the use of a load center which has been known to our industry for many years and which has proven its value through years of experience. This principle may readily be extended to cover other appliances now found in our kitchens, or adjacent thereto; the automatic washer, the clothes dryer, the ironer, the refrigerator, the freezer and the numerous portable devices.



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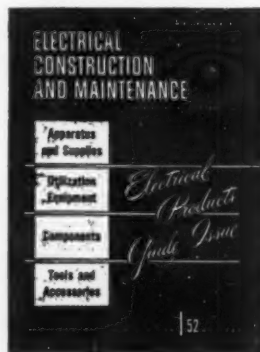
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For more complete information, and application data on their lines, refer to the Index of Advertisers in the **ELECTRICAL PRODUCTS GUIDE** . . . the 13th issue of **ELECTRICAL CONSTRUCTION AND MAINTENANCE**.

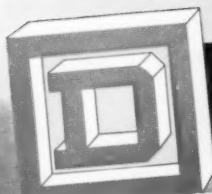
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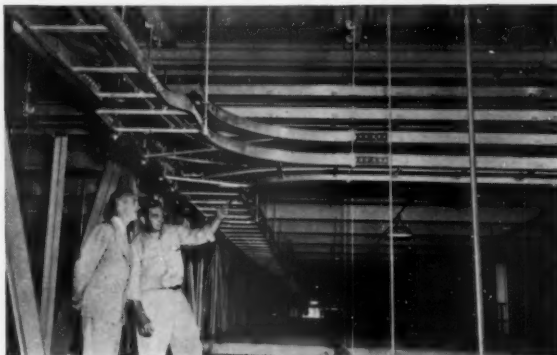
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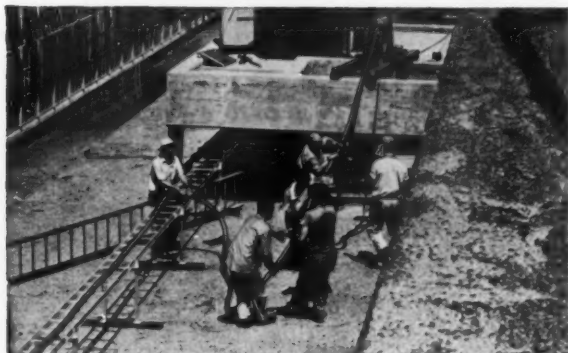
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